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ENGINEERING AND MINING JOURNAL-PRESS

A CONSOLIDATION OF ENGINEERING AND MINING JOURNAL AND MINING AND SCIENTIFIC PRESS

The Golden Ladder

The 16-cu. ft. buckets of this California dredge mine the auriferous gravel for its precious contents

Instruments and Methods for the Discovery of Useful Mineral Deposits

—A summary of geophysical processes and the apparatus employed

By Dr. C. A. Heiland

Reconstruction and Improvements at Mason Valley

By George J. Young

Volume 121 January 9, 1926 *Number* 2

ENGINEERING AND MINING JOURNAL-PRESS

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Next Week

THE Fifty-seventh Annual Review Number of *Mining Journal-Press* will be published next week, January 16, 1926.

MEMBERS of the editorial staff have been occupied for several months gathering information and statistics for important articles which will appear on the developments and progress made in mining and metallurgy during 1925.

AUTHORITATIVE data showing the trends and conditions of the industry will be found in this issue. Among the contributors will be prominent executives and important men in the mining and metallurgical industries. The survey will be world-wide in scope.

THE advertising section will include the announcements of new machinery and equipment, and practically every leading manufacturer whose products are used in mining will be represented.

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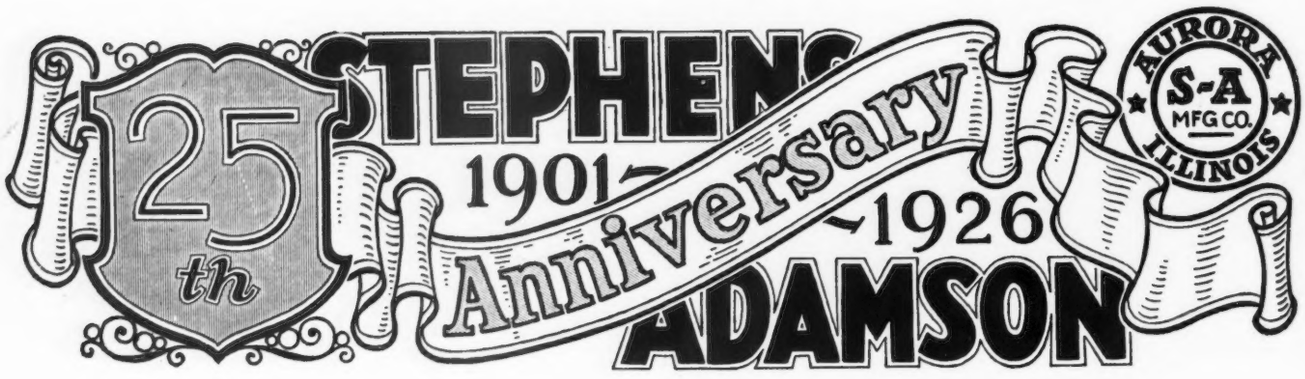

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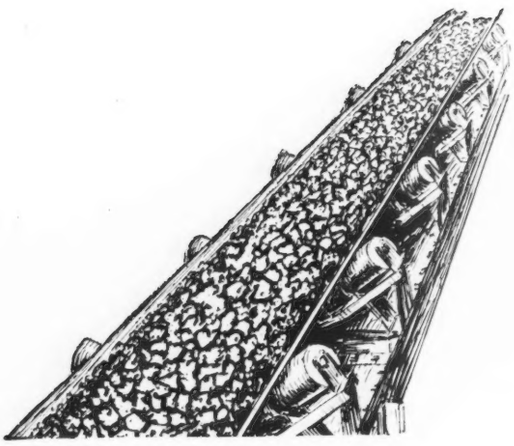

Several important installations of 1925 have definitely established the economies of long distance belt conveyor transportation.

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JOSIAH EDWARD SPURR, Editor

Volume 121 New York, January 9, 1926 *Number* 2

The 1926 Business Outlook

PROGNOSTICATIONS as to the future trend of business prosperity are difficult to make with exactitude, on account of many composite and uncertain factors. Nevertheless, the students of business cycles have made great progress, and the opinions of the best of these are to be taken like the best opinions of doctors, or of the weather man, as well worthy of consideration and as a basis for planning, without being infallible. The uncertainties attendant upon these economic prophecies render the economists themselves cautious: but they do not hesitate to indicate the trend of these figures and curves. There is, for example, the recent prediction of Colonel Leonard P. Ayers, vice-president and statistician of the Cleveland Trust Co. Mr. Ayers was in charge of statistics for the War Industries Board during the war; in which work, indeed, he won his colonelcy. He is generally regarded as a highly competent statistician and economist. Colonel Ayers' prediction for 1926 is a year of prosperity, slowing up in late summer; a greater iron and steel production than in 1925, high building costs, rising wages, higher wholesale and retail prices, a higher volume of industrial employment, all coming to a peak and turning down; building construction rising to a new record and then starting downward; the ending of the Florida boom; and the termination of the bull market on stocks, through the action of the New York Federal Reserve bank in raising its rate to prevent the unlimited use of bank funds for speculative purposes.

A general expectation of the same nature is held by other economists, and set forth in circulars of such organizations as the Harvard Economic Service, and Moody's. The opinion of these coincides essentially with that of Colonel Ayers—the line of reasoning, to repeat, being that higher rediscount rates by the Federal Reserve bank may be necessary to check the speculative use of credit resources—which might cause a sudden rise of money rates, and a possibly severe subsequent reaction in business. The general advice is that "conservative policies should govern business operations."

Northern Ontario: A Great Mineral District

INITIATION of dividend payments by the Teck-Hughes mine, in the Kirkland Lake district of Ontario, is another evidence of the extraordinary success that has attended operations in that camp. The gold veins extend in a substantially straight line, approximately east and west and beneath the waters of Kirkland Lake, and have proved profitable to several companies. The Lake Shore mine, at the west end of the lake, was the first to pay regular dividends; then came Wright-Hargreaves, at the east end of the lake; and now Teck-Hughes, adjoining Lake Shore to the west. Still further to the west, the Kirkland Lake mine has recently run into good ore at depth, and promises to be profitable in time, and conditions are at least encouraging in the country to the east. Though all of these properties are small, being equipped for capacities of 500 tons a day or less, they seem destined for a long life, and have already produced close to $20,000,000 worth of gold, more than a quarter of it in the last year. No property in the camp has been a total failure so far, with the possible exception of what is now known as the Kirkland-Rand, which, after numerous reorganizations, may yet develop a mine to go with its mill. That property is, however, off the "main break" which the other companies have found so profitable.

Porcupine, of course, continues as one of the most important gold camps of the world, the 1925 production of about $24,400,000 bringing the total for that district up to approximately $161,000,000, with the future looking as bright as ever. The gold of Porcupine and Kirkland Lake, together with the silver of Cobalt and the nickel and copper of Sudbury, all of which are contained in a block of country of about 20,000 square miles in area, combine to make what is perhaps the most profitable mining district of its size in the world. Its future has unlimited possibilities, Cobalt proper being the only part of it which gives evidence of having seen its best days. And, as has been said before, outlying parts of northern Ontario and Quebec afford what is perhaps the most favorable ground for the prospector of any on the continent.

The Mining Catalogs

NOT ONLY as a source of equipment and supplies does the manufacturer perform a service to the mining industries. He has often made important contributions to their technical progress in working out problems that arise in designing new machinery to meet certain specifications. Any survey of the industries must therefore give him due consideration. It will interest many to note that the McGraw-Hill Co., which publishes *Engineering and Mining Journal-Press* and *Coal Age*, has just acquired the two Keystone Mining Catalogs and the Coal Catalog, as well as the mining and quarrying directories and the list services hitherto conducted by the Keystone Consolidated Publishing Co. of Pittsburgh, Pa. A full account is given on page 71 of this issue.

Michigan's Low Grade Iron Ore

THIRTEEN years ago, in January, 1913, the estimate of assured taxable reserves of iron ore in northern Michigan was almost 194,000,000 tons. One year ago the figure was only about five and a half million tons less, although in the meantime over 150,000,000 tons had been shipped. These figures were given by L. P. Barrett, State Mine Appraiser for Michigan, in an article in the *Iron Trade Review* a few months ago. They serve to illustrate how difficult a matter the proper appraisal of a mineral resource may be. The problem is twofold: irregularities and complexities of

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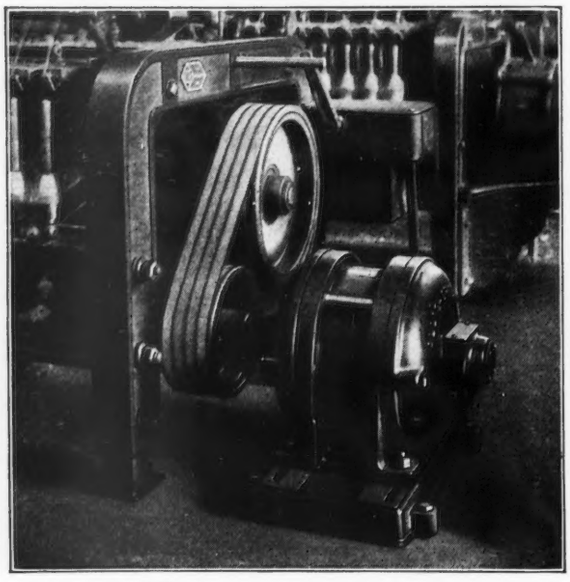

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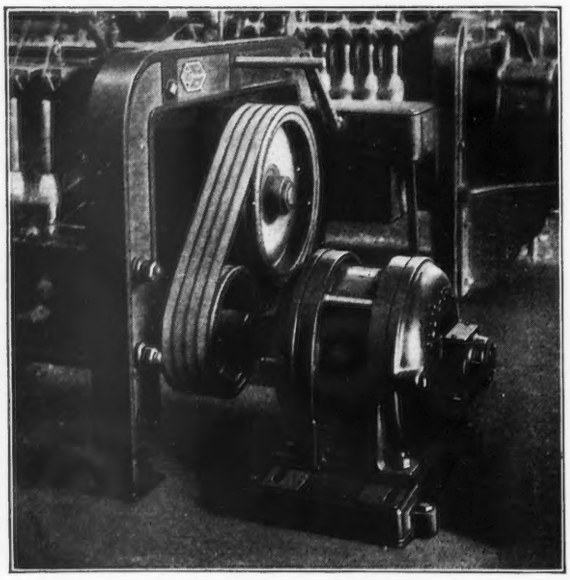

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said to supply the world. On the other hand, imports were received, to the value of a million or more, from seventy nations. The nations sending us supplies to the value of 100 millions or more were Canada, Great Britain, Japan, Cuba, Straits Settlements, Brazil, Mexico, China, France, Germany, and British India. As a complement to a statement before made, the United States affords a market for the world.

The 110 millions or more of people within the limits of the United States present the most remarkable condition in all history in that they are not only extraordinarily busy in digging from the ground and growing a diversity of products, transporting, manufacturing, selling, and trading in them with other nations, but they are also consumers of products whom no other nation has ever equaled. The extraordinary standard of living attained is one of the reasons for this outcome, but more important is the virile, impatient, and aggressive character of the cosmopolitan population that graces this land, with its numerous schools, its stadiums, its sports, its duplexes, its apartments, its huge office buildings, its network of roads and rails, its busy autos, and its mad whirl of forty-eight or more political "complexes." In the midst of it, the miner and his counterpart in the petroleum industry make good in an unassuming way and supply many of the raw materials that give the rest of us opportunity and needed things contributing to easy and comfortable living.

What to Do About High Rubber Prices

METAL AND RUBBER have long been more or less connected, from the marketing standpoint: witness the space devoted to rubber in the London *Metal Bulletin*, and the recently formed Metal and Rubber Club here in New York. The connection would seem to be an unusual one, and it is extremely slight in the United States, where the two markets are entirely separate. It apparently had its origin in the fact that both tin and rubber come from the same part of the world, and that English importers of the one found it profitable to take an interest in the other.

In 1913, rubber sold at widely varying levels, from 50c. to $1 a pound, that being before the rubber plantations of the British Far East were of much importance, compared with their status today. After the war, rubber was a drug on the market for some years, prices being down around 15c. and considerably below the cost of production. Finally the British Government took a hand and limited exports, except at prohibitive duties, arranging to release a gradually increasing quantity every quarter year as the price rose to certain levels. Recently, the price has risen faster than the contemplated quarters came around, and spot rubber has soared above $1 a pound, which is about three times what is admitted to be a fair price for the commodity. Loud wails immediately arose from various agencies in the United States, which country consumes 60 or 70 per cent of the world's production, and reprisals have been threatened. The other day, for instance, a bill was introduced into the Massachusetts State Legislature for the purpose of driving out British fire insurance companies.

Fortunately, Secretary Hoover has adopted a sane attitude, and has advised against all attempts at direct reprisals. He is thoroughly sound when he suggests that the proper way to meet the difficulty is either to use less rubber or produce more ourselves. What Great Britain chooses to do about matters of production is her own affair. Attempts to regulate the production of cotton, wheat, and tobacco have been made in this country, the government having offered suggestions, which, if not having the force of regulations, at least have the spirit. The right of a country to impose high protective duties is unquestioned, and export duties are not without precedent. The loud talk of reprisals would come with more grace if American consumers had not had the benefit of several years of too low prices; if the Stevenson rubber-restriction scheme had been done with malice aforethought; and if a country other than England had sponsored it. That country has had plenty of economic troubles of its own, and yet has shown a desire to pay its debts to the United States.

Finally, it may be mentioned that the assumed loss to American consumers of $700,000,000 a year, as reported, is not at all as figured. That might be the loss if buyers were paying any such price as $1 or $1.15 a pound, but they are not, supplies having been contracted for long ago, and the price for the first eleven months of 1925 having averaged about 46c. a pound. In that period 799,000,000 lb. of crude rubber was imported, valued at $158,000,000, according to the U. S. Department of Commerce. The price is unlikely to stay at the current high level long enough to pay the English war debt, or anything like it, as has been suggested. Use less and produce more: those are the remedies. And it may be well to keep in mind that the production of synthetic rubber on an economic scale, as has already been done on an experimental scale, is not without the bounds of possibility in the near future.

Research

A REVIEWER looking over the affairs of 1925 notes that in the last month of the year the attention of the public was drawn to the subject of research. Two prominent citizens gave utterance to their views on different phases of the subject. Secretary Hoover pointed out how little was spent for pure science in the United States in contrast to the large sums annually expended in the development of industrial science. He pleaded for greater application to pure research, on which foundation our industrial structure rests. Dr. Nicholas Murray Butler, a fortnight later, made pertinent comments on what is popularly called research, much of which, he said, "is not research at all but simply rearrangement or reclassification of existing data or well-known phenomena."

The variety of research to which Dr. Butler caustically refers is known not only to universities and institutes but to many a business house as well. The research man has succeeded the efficiency man, so popular a decade and more ago. Most of his work consists simply in looking up what has been done or published in regard to the subject under scrutiny. This is research of a kind, of course. The assembling of such information is oftentimes quite necessary. After all, what constitutes research is largely a matter of definition. To Dr. Butler it means an inquiry to determine the unknown. It is wise, however, before undertaking such an investigation, to survey the known and define its limits. Indeed, it is difficult to think of a researcher entering upon his task without a background of the known well fixed in mind. The research criticised by the respected president of Columbia is research, though of a lowly, preliminary kind.

geological structure must be solved or guessed at, and the line must be established between merchantable ore and waste, the position of this line varying, of course, with changing economic conditions.

A committee of Michigan iron-country mining men, headed by Dr. W. O. Hotchkiss, has undertaken to find the most practical way of making a survey of Michigan's low-grade iron-ore resources. Some work has been done, but much remains to do before a reliable estimate can be reached, it is reported. The committee is looking ahead to the time, not so far hence perhaps, when the present reserves of high-grade ore on the Lake Superior ranges shall be exhausted. Perforce lower-grade material will then be sought for domestic furnaces. Of this there is a huge tonnage, and of varying grades, that will successively become merchantable as market prices and treatment costs permit. Then, ore washing will be standard practice instead of the exception, as today.

Mining of low-grade ore in Michigan, according to Mr. Barrett in the article referred to, is now limited to the production of high-silica grades for special purposes. No effort has been made to beneficiate Michigan ores as on the Mesabi in Minnesota. On the Michigan ranges there is an immense bulk of "iron formation" running 30 to 33 per cent iron. Several billion tons of such material can be estimated, he says, even no deeper than 300 ft. Between this iron-bearing rock and the present merchantable grades there are doubtless considerable tonnages of material between 40 and 50 per cent iron, not merchantable at present. The survey has progressed far enough, he says, to warrant the statement that should the line between merchantable ore and waste be set at 45 per cent iron content, the known assured tonnage of ore would increase considerably.

The survey has an excellent objective. It is well to consider the possible future value of present unmerchantable ore before developing a mine. Selection of the wrong method of mining may make it impossible to save the leaner material for future treatment whenever it will pay to work. According to some, a large tonnage has already been lost in the Birmingham district in this manner.

Tailings Become Ore

THE QUESTION as to when tailings become ore, commented upon in a *Mining Journal-Press* editorial of Nov. 21, 1925, has been answered by the Public Utilities Commission of Idaho. The particular case in question was the proper classification of tailings shipped by Harr Brothers to a mill and smelter. The railroad company classified the material as concentrate and applied the 68c. rate. The freight rate on ore having a value of $20 per ton or more was 50c. per ton, while an ore of less value took a 30c. rate. The shippers contended that the material they are shipping is ore, and, further, that it was worth less than $20 per ton. The commission upon hearing evidence and the citation of authorities upheld the contention of the plaintiff, and in an order under date of Dec. 19, 1925, held "that the commodity shipped by the plaintiff over the lines of the defendant is 'crude ore' of a value less than $20 per ton," and instructed the railroad company to consider it accordingly.

The justice of this decision is apparent, and its importance to the mining industry is far reaching. The commission is to be congratulated upon rendering its reply in accordance with the best authority in the mining industry. Tailings do become ore when they can be worked at a profit, and as years go by more and more of the old dumps, ponds, and waste of today will become an ore for succeeding generations.

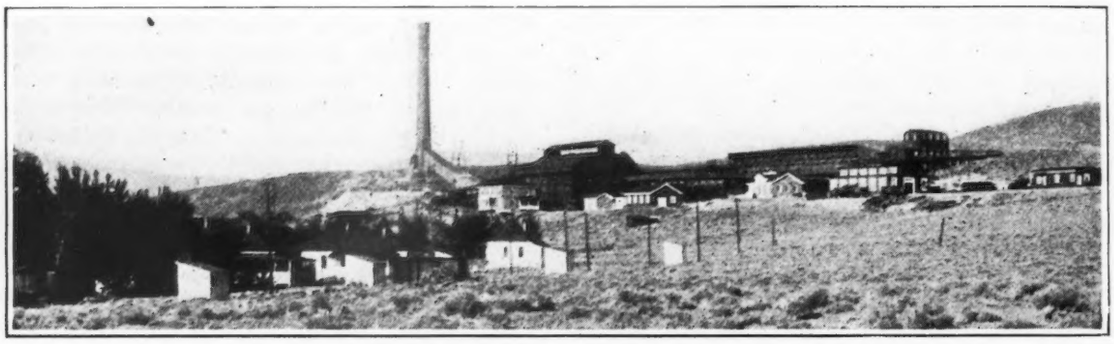
Mining and National Prosperity

ALTHOUGH many of us, in a more or less vague way, realize that trade in its various aspects is essential to national well-being, we are likely to take things as a matter of course and are not particular in our acceptance of whatever general prosperity it may be our good fortune to experience. However, when it is realized that our domestic exports totaled $3,436,992,000 in the first nine months of 1925, a gain of 12.5 per cent over the corresponding period of 1924, our indifference vanishes. The huge total mentioned is slightly over $31 per capita, or about three-quarters of the per-capita money in circulation in the United States, which was $42.77 in November.

A more detailed examination of the export figures presented by the Chamber of Commerce of the United States indicates that exports which are essentially concerned with metals or minerals, either derived therefrom in the case of the latter or manufactured therefrom in the case of the former, total somewhat less than a billion dollars. The tremendous importance of our mineral industries is at once apparent. We cannot escape the fact that the miner, the ore dresser, the smelterman, and the metallurgist are busy people and contribute mightily to national prosperity. Grouping the figures in another way, we exported about a billion dollars' worth of comparatively raw materials and over a billion dollars' worth of manufactured goods. In addition, we exported somewhat less than a quarter billion in unprepared foods and well over a quarter billion in manufactured foods. There is thus more or less of a balance in exportable products which require a minimum of labor and those which entail a maximum of labor in their production. We have left the other fellow who trades with us a reasonable chance to apply his own labor to the raw materials which we export.

Furthermore, we imported in the nine months of 1925, raw materials and goods to an amount of slightly over three billion dollars' worth, leaving a balance, exports over imports, of $357,437,000 in our favor for the nine months. It is of interest to note that most of our imports are substances of an organic nature (excluding such things as works of art, which amount to a considerable figure, as well as tin, sodium nitrate, diamonds, and unrefined copper).

Our most important exports are raw cotton, automobiles with the inevitable parts and accessories, gasoline and similar hydrocarbons, wheat, refined copper, lard, tobacco, coal and coke, lubricating oils, and flour. Of mineral substances and derivatives and metals, our principal exports were refined copper, coal and coke, illuminating oils, iron and steel, lead, zinc, and others not specifically listed in the report before us. Our best customers were Great Britain, Canada, Germany, France, Italy, Cuba, Japan, Mexico, The Netherlands, Australia, Argentina, Belgium, Brazil, and China. In all, seventy-six nations purchased goods to the extent of a million dollars' worth or more. Some thirty-two nations purchased to the amount of ten millions or more. Thus the industries of the United States can be



Thompson smelter, near Wabuska, Nev.

Reconstruction and Improvements at Mason Valley, Nevada

Thompson Smelter Repaired—Adits and Shaft Provided and Haulage System Completed at Copper Mines—Mill Overhauled and New Equipment Installed

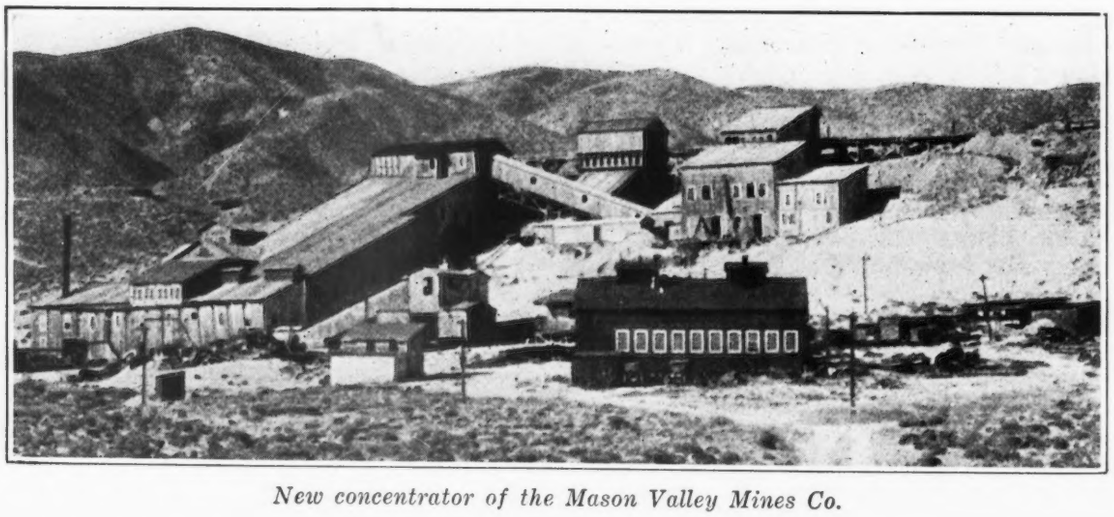
By George J. Young
Associate Editor

THE MASON VALLEY MINES CO. closed down in February, 1919, at which time it was operating mines in Mason Valley and a smelter at Thompson, near Wabuska, Nev. The uncertain copper situation was the important factor that influenced the policy resulting in a temporary cessation of operations. Practically no work was done until 1924. Early in that year the company sold its interest in the Gray Eagle mine and purchased the property of the Bluestone Mining & Smelting Co., acquiring sufficient financial resources to strengthen its position greatly. Work rehabilitating the Thompson smelter and the mining properties in Mason Valley was begun in 1924, under the management first of William Kroener and later of Emmet D. Boyle.

The history of the Yerington district[1] is of interest. Production began in 1905, although in the '60s and '70s some production in the form of bluestone was made for the pan-amalgamation mills of the Comstock. The district lacked major facilities, and these were provided by the Mason Valley Mines erecting the smelter and the Nevada Douglas Copper by financing the Nevada Copper Belt Railroad, which connected the Mason Valley, Ludwig, and the Bluestone mines with Wabuska. The Nevada Douglas agreed to furnish a certain tonnage to the smelter, but was unable to do so. Mason Valley Mines also encountered difficulties, and when war broke out shut down. Operations were resumed in 1917, and after slightly over two years both mine and smelter shut down. During the war, the Bluestone mine shipped considerable copper carbonate ore and then built a concentrating mill of 400 tons' capacity. It shut down about the same time as the Mason Valley Mines, and then the decision was made to enlarge the mill to 800 tons' capacity. A ball mill was installed, and the property was subsequently shut down in March, 1920. The history of the Nevada Douglas is involved and is not of particular interest here except to state that a leaching plant was erected, but its operation was apparently not successful, as the plant has been dismantled. The total production of the Yerington district from 1905 to 1921 was 1,412,000 tons, yielding copper, 85,846,000 lb.; gold, 30,000 oz., and silver, 23,000 oz. The Thompson smelter was for a time an important custom smelting plant.

Present reconstruction is concentrated upon the smelter, the Bluestone mill, and the two mines, the Mason

[1]The geology and descriptions of the mines are given in Adolph Knopf's paper on the district; Professional Paper 114, U. S. Geological Survey.

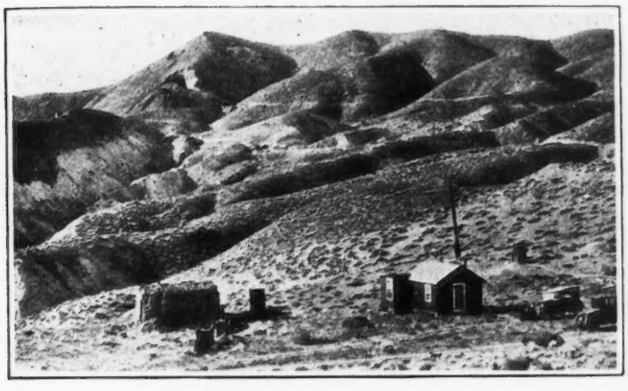


New concentrator of the Mason Valley Mines Co.

Valley and the Bluestone. The ore deposits consist of disseminated chalcopyrite, with pyrite and some bornite in altered limestones and associated metamorphics in the Triassic. In the "Mines Handbook" the Bluestone is credited with reserves, as of 1917, of 1,600,000 tons of 2.6 per cent ore and the Mason Valley mine with 1,000,000 tons of 3 per cent ore and 500,000 tons of 1 per cent ore. The Mason Valley mine produced 500,000 tons of ore averaging around 3 per cent copper.

Adit Haulage Planned

Transportation facilities to the mill from both the Bluestone and Mason Valley mines are provided by a 24-in. gage track of 40-lb. rail which contours the hills on a low grade in favor of the load and connects with an adit at each mine. Haulage is by trolley locomotives. The Mason Valley mine adit extends to an underground shaft which connects with the 570 level, 300 ft. below the adit level. The shaft is 15 ft. 4 in. by 6 ft., divided into two skipways, 4 ft. 10 in. by 4 ft. 8 in., and a manway, 3 by 4 ft. 8 in. The timbers are 8x8 in. in section, spaced 4-, 5-, and 6-ft. centers, according to the ground. It is served by a double-drum electric hoist and three-ton skips. Loading bins with steel measuring pockets are provided below the 570 level and loading bins at the adit level. Two loading chutes which are equipped with under-cut gates and overhead loading platforms are provided for loading the adit trains. Haulage on the 570 level is by two three-ton trolley locomotives and two-ton side-dump cars, 18-in. gage tracks being provided on the lower level. At the hoisting station a 1,200-cu.ft. compressor has been installed. This is motor-driven by a short-center belt. A 6-in. air main connects with the workings. A 2½-in. water pipe and an armored power cable are in the adit. Practically all of the foregoing installation is new.

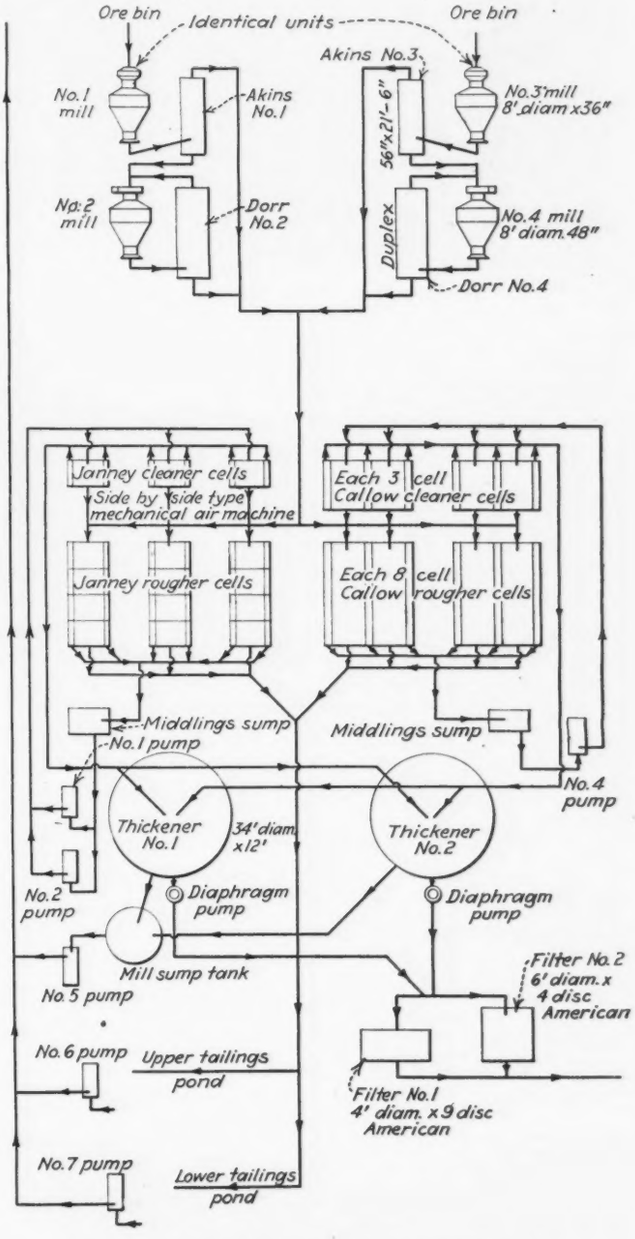


Open pit in distance marks the Mason Velley mine

The Mason Valley mine was worked by shrinkage stoping, and the present stopes are partly filled with broken ore. Resumption of stoping will be an interesting mining problem, but it is planned to mine sufficient ore remaining in the walls and in pillars to retrieve the present stopes and provide filling of broken ore sufficient to regain working positions. Ore below the present stopes will be mined by shrinkage stoping.

The walls of the deposit usually stand well. At the Bluestone mine, which was worked by a glory-hole pit, it is planned to continue mining by this system until the open pit reaches its lower limit, when underground mining will be in order. Transportation and ore mining are being planned on the basis of minimum cost. Shaft equipment and adit haulage has been planned to handle 50 tons per hour. The Bluestone haulage system has been designed to handle 100 tons per hour.

The mill has been practically reconstructed; and the milling scheme, based on 1,000 tons per day capacity,



Flow sheet of Mason Valley concentrator

is relatively simple. The ore is dumped into a receiving bin at the crusher and reduced to 1-in. size and delivered to the mill bin by a belt conveyor. The mill is arranged in two units, as shown in the accompanying flow sheet. Fine crushing is by two conical ball mills in series, the first delivering to an Akins classifier, which discharges oversize into the second mill operating in closed circuit with a Dorr rake-type classifier. The overflow from both classifiers goes to flotation cells, producing tailings and a rough concentrate, which is handled in cleaner cells placed at a higher level. The tailings from the cleaner discharge into the roughers and the concentrates are laundered to thickeners. Diaphragm pumps remove the thickened concentrates, delivering them to two

In the open pit, Bluestone mine

American filters. Mill reconstruction was well advanced early in October.

MILL AND WATER-SUPPLY SYSTEM REBUILT

The mill water-supply system has been completely reconstructed and an additional 4-in. pipe line of lap-welded casing with welded joints, 8,893 ft. in length, has been installed connecting with pumping plants close to the edge of Mason Valley. Water is pumped against a head of 691 ft. from several wells by two vertical triplex pumps and one horizontal pump, aggregating 239 gal. per minute in capacity. The pipe line is in duplicate for the last 500 ft. of its length.

The Thompson smelter includes in its equipment a crushing and sampling plant with a conveyor system for handling the ores, ore bins, two large copper blast furnaces, two sintering machines of the Dwight-Lloyd type, two converter stands, and a copper-casting machine. The work of rehabilitation consists of repairs to ore bins and to the mechanical equipment. This work has been advanced to the point where smelting can be resumed in one blast furnace. A thorough study of the potential sources of custom ore in Nevada and California mining districts has been made and preparations for the re-establishment of the custom smelting business which is closely related to the resumption of mining have been well advanced.

The Mason Valley district is an important mining area, and resumption of operations, particularly of the Thompson smelter, will do much to stimulate mining in Nevada and in California. The work of rehabilitation, under the direction of Emmet D. Boyle, is being conducted in a thorough manner and with special attention to the attainment of low operating costs. No announcement has been made of the date of resumption of operations, but the position of the work is such that they can be started in a comparatively short time.

[It is with sincere regret that we received the announcement of Mr. Boyle's sudden death as this article was going to press.—EDITOR.]

Adit of the Bluestone mine

Pumping an Oil Well by Air Lift

By S. F. Shaw

Petroleum and Mining Engineer, San Antonio, Tex.

A well situated on the Zutz farm, Section 13-33-16, 7 miles southeast of Independence, Kan., and leased to C. G. Chandler, has recently been fitted up by me for air-lift pumping. The casing, 6¼ in. in diameter, is set just above the oil sand, at approximately 1,380 ft. depth. When pumped "on the beam" production was about 900 bbl. of fluid oil per day, of which 17 bbl. was oil of gravity of 26 deg. Bé. When pumping was done at this rate the fluid level stood at 350 ft. below the surface. The well was then equipped with a Shaw flowing device, with especially designed tubing, and with a headpiece, and air was supplied by an Ingersoll-Rand 12x14 in. x 5½ in. x 14 in. two-stage compressor with a displacement of 311 cu.ft. of free air per minute, and built to handle a pressure of 700 lb. per square inch. The compressor was driven by an Ingersoll-Rand 100-hp. crude oil engine, the fuel for which is taken directly from the well on the lease.

The fluid level was lowered by this means to 950 ft. below the surface, under which condition the production was increased to about 1,300 bbl. of fluid per day, of which 40 bbl. was oil. The yield was increased to two and one-half times that obtained when pumping "on the beam." The discharge from the air lift is continuous, in which respect it differs markedly from the usual discharge in the ordinary air-lift operations in oil wells.

Industrial Uses for Volcanic Ash Limited

The annual report of the Saskatchewan Bureau of Labor and Industries contains references to the volcanic-ash deposits of that province, stating that volcanic ash as found in Saskatchewan is a semi-indurated, light-colored rock formation resembling a white, fine-grained sandstone. The principal physical characteristics which aid in its detection are its low specific gravity and entire lack of plasticity when moistened.

The known uses to which the ash may be put are few, but it is thought that some experimental work could be done which would result in discovering a great many new uses for this material. At present the chief use of the ash is in the manufacture of polishing pastes and cleansers, which is a comparatively simple process. The sequence of operations in the manufacture is as follows: Mining, grinding to the required degree of fineness, mixing with other ingredients when necessary, and finally the packing in suitable containers for the market. Provided the raw material be mined and transported cheaply, the cost of production can be kept low.

Instruments and Methods for the Discovery of Useful Mineral Deposits

A Summary of Geophysical Processes for Determining Composition of Subsoil and the Apparatus Employed, Together With a Tabular Classification and a Selected Bibliography of the Literature on the Subject

By Dr. C. A. Heiland
Research Scientist, Berlin-Friedenau, Germany

THE TASK of locating and exploring useful mineral deposits has hitherto fallen almost exclusively to the practical geologist. By following up existing data, and with the help of borings and shaft sinkings, he has had to draw his conclusions as to the supply of useful minerals from the examination of the strata actually encountered. This method of working has now been supplemented by another, which has arisen out of the necessity of obtaining information as to the composition of the subsoil in districts where surface indications are absent.

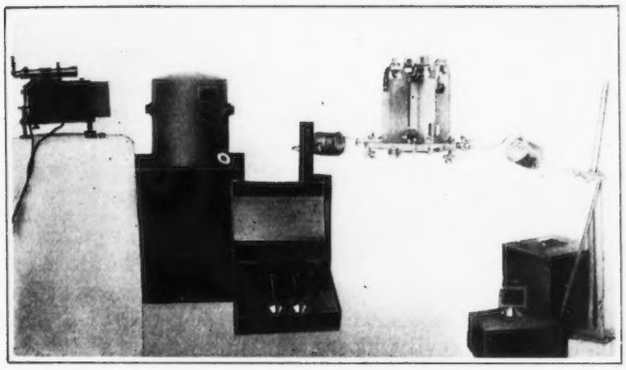


Fig. 1—The Sterneck four-pendulum apparatus

The new method is based on the fact that the earth's crust is built up of constituent parts which have different physical properties, the direct or indirect influence of which can be measured at a distance by means of suitable apparatus. It follows that the possibility of proving the existence of a useful deposit by the application of physical methods depends on its having physical properties sufficiently different from those of its surroundings to admit of measurement at a certain distance. It is best, of course, if one can measure more than one of the physical properties of the deposit which is being sought. Hence the great variety of methods hitherto employed, which I will try to summarize herein as far as the limits of this paper will allow.

Geophysical processes for determining the composition of the subsoil can be divided, as regards system (see table on page 56), into two distinct groups, which differ in their essence. One of these is based upon determining the natural action of the existing stratum-complexes and includes the measurement of the gravity and the magnetic field, of thermic and radioactive influences.

In the second group, on the other hand, the deposits which are sought first become apparent through their reaction to fields of force artificially produced. This latter group embraces methods which involve the testing of the reaction of the deposits to elastic and wireless waves and electric currents.

Dealing first with observations belonging to the first group, a stratum-complex can be determined by measuring the difference which it produces in the normal field of gravity. The determination of relative gravity is usually effected nowadays by means of the four-pendulum apparatus designed by Sterneck (Fig. 1). This consists of four half-second pendulums, whose swing duration is measured by the coincidence method. The coincidence apparatus, of which the movable diaphragm beats in unison with the contact chronometer used for comparison and which, at the moment of coincidence, allows a slit of light reflected from the pendulum mirror to coincide with the cross-web on the objective of the telescope, is shown on the left of Fig. 1.

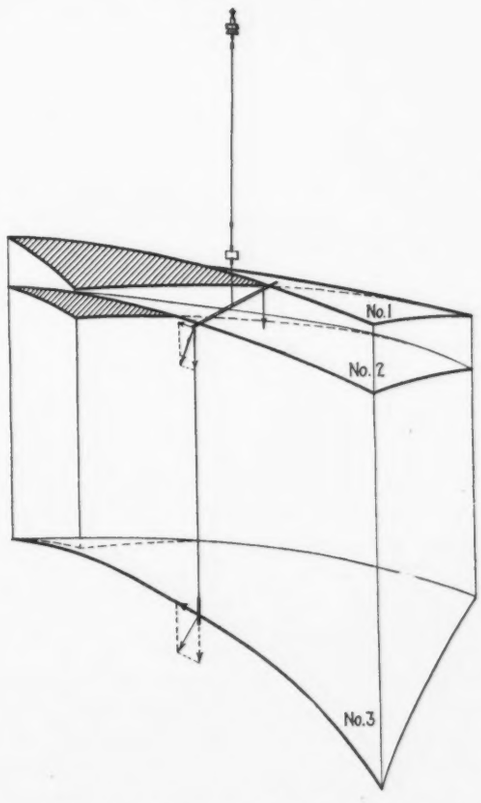


Fig. 2—Diagram showing action of Eötvös torsion balance

When placed over heavy masses the pendulum swings faster, because the force of gravity is greater. This

apparatus, however, can only be used with success for locating tectonic masses, such as mountain ridges covered up by subsequent stratification, because despite the great exactitude of the swing measurement—the swinging period being determined within a few ten-millionths of a second—such minute variations in the force of gravity as those caused by local deposits cannot be determined. The same holds good as regards observations of plumb-line variations effected by ascertaining the astronomical and geodesic latitude and longitude. But these measurements can yet be of some

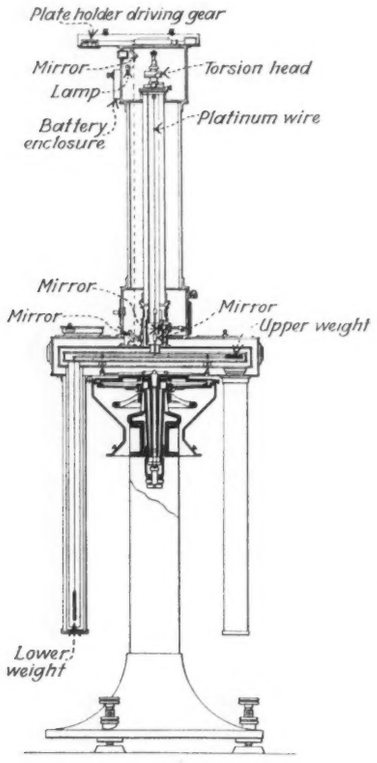


Fig. 3—Sketch showing construction of Eötvös torsion balance, Schweydar-Bamberg model

practical significance by reason of the fact that useful deposits, such, for example, as coal, are found in conjunction with the mountain formations which they are capable of locating.

A much more sensitive instrument for ascertaining the presence of local deposits is the torsion balance, No. 2 type, designed by the Hungarian physicist Eötvös. It consists (Fig. 2) of a horizontal balance beam, which is suspended by a rod carrying a mirror on a platinum thread 0.04 mm. thick and has its ends weighted by means of weights, one of which is suspended 60 cm. below the other, on the end of a brass thread. In practice two such balance systems are used, one beside the other, with their hanging weights set 180 deg. away from each other.

As the behavior of gravity in space can be represented by imaginary planes of equal gravity potential, one such plane being assumed to pass through the upper and one through the lower weight on the balance beam, there will arise a horizontal component which will impart a certain torque to the beam and a corresponding twist to the thread by which it is suspended, whenever it happens that these two horizontal planes, and consequently the lines perpendicular to them representing

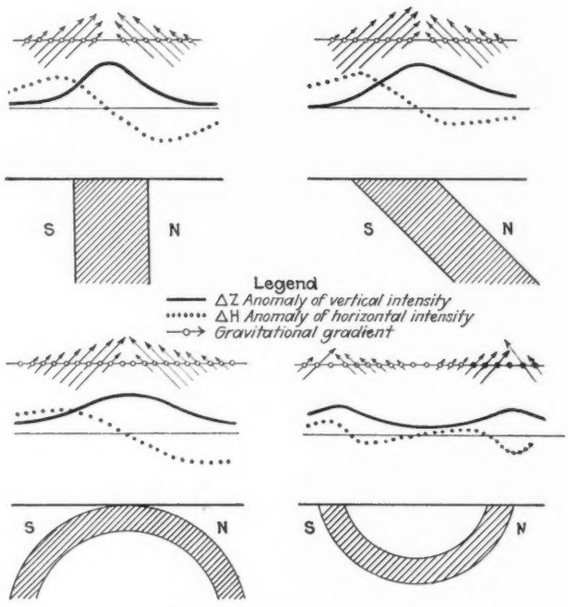


Fig. 4—Diagram showing the behavior of gradients of gravity, and of the vertical and horizontal intensities, above the most usual occurrences of useful mineral deposits

the direction of gravity, form an angle with each other, as shown in Fig. 2. In this connection, an angle as small as about one hundred thousandth of an arc-second can be determined. The greater the speed with which the force of gravity alters, the more pronounced will be the convergence of the horizontal planes, and therefore this torsion balance does not show the absolute force of gravity, but merely its speed of alteration or *gradient* at the point of observation.

If we now suppose that the suspended weight has been brought up and placed on the balance beam, there will be a further torque if two horizontal planes passing through the ends of the beam are not parallel with each other. From the resulting rotation of the beam two values can be deduced, which make it possible to judge the form of a horizontal plane imagined as passing through the center of gravity of the suspension system. The theory of a double balance requires that the displacements of the balance beam shall be meas-

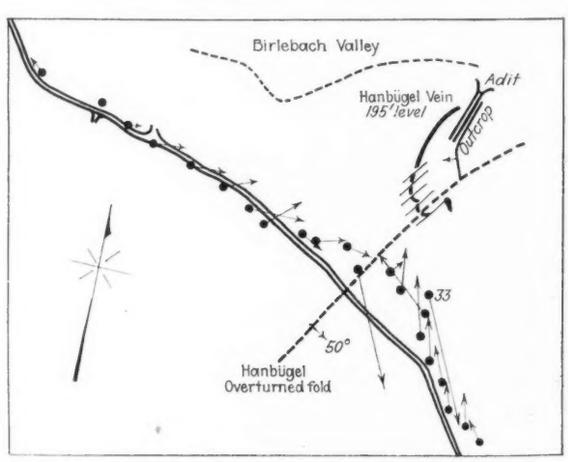


Fig. 5—Measurements obtained by the "Exploration" Gesellschaft in the Hanbügel lode area (Siegerland), from the report by H. Quiring, Glückauf, 1923, No. 17

ured in three different azimuths. Fig. 3 shows a sketch of a double balance as above described, made by the Askania-Werke at Berlin-Friedenau and designed to permit of the upper part turning automatically in the measuring azimuths, and also to give a photographic record of the displacements of the beam. The balance is highly sensitive and has to be isolated from air currents or thermic action by a triple metal case. Fig. 4 illustrates the behavior of the gradients above a few examples of useful deposits. It will be seen that the gradients of gravity, indicated by arrows, always point to the heavy mass and are usually at their maximum above the edges of it. In the same way, the main direction of curvature of a level plane alters in the vicinity of the edges. The principal objects the presence of which can be proved by means of the torsion balance are: ores, salt domes, nearly all cases of overlaid tectonics, for example, the outlines of (filled-in) valleys, and indirectly, also, petroleum, owing to the fact that it occurs in anticlines and at the edges of salt domes. Fig. 5 shows the results of measurements taken above an orebody in the Hanbügel lode district (Germany). To the left of the Hanbügel drift, the gradients increase slowly above the vein of siderite which falls away to the northwest, reaching their maximum above the outcrop; then their direction alters, and (with the exception of gradient 33) they decrease rapidly toward the southeast. This is an instance of Case 2 as illustrated in Fig. 4. Fig. 6 *A* and *B* shows results of my measurements above a valley profile. The maximum gradient in this case coincides with the point where the subterranean slope is steepest. Fig. 7 shows the measurements taken by the "Exploration" Gesellschaft above the salt ridge of Oldau-Hambühren. The gradients point away from the salt ridge and make it possible by joining up their maxima to locate the flanks of the ridge with considerably greater accuracy than could be done on the strength of geological conjecture.

A further means of locating useful deposits is provided by the changes which they induce in the normal behavior of the field of terrestrial magnetism. The size and direction of this are unmistakably determined by the size and direction of the aggregate or total intensity. They could be ascertained by noting the direction and the duration of the swing of a magnetic needle. Two component intensities are usually recognized, the horizontal and the vertical. The direction of the horizontal intensity forms an angle with the astronomical meridian, and this is known as declination.

Experience has shown that a practical means of completely determining the earth's magnetic field is to note the declination, the horizontal intensity, and the inclination. The instrument used for this purpose is the magnetic portable theodolite (Fig. 8), with declinator, deflection and swinging device, and inclinator. However, the location of useful deposits usually does not require a knowledge of the entire magnetic field, and it is generally sufficient to measure the horizontal and vertical intensity. For this purpose the Thalén-Tiberg magnetometer, which measures the horizontal

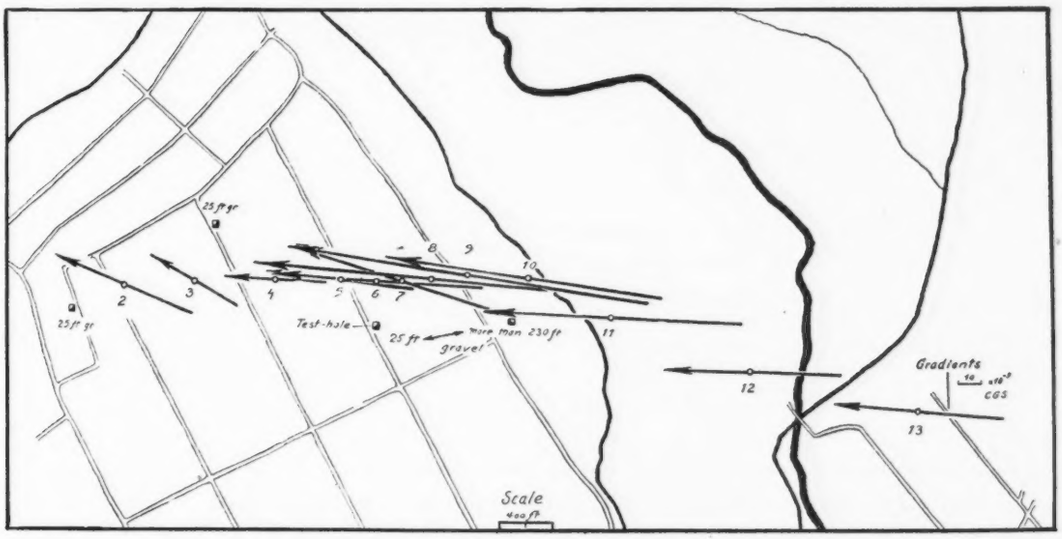


Fig. 6 A—Gravity gradients above the border of a hidden diluvial valley

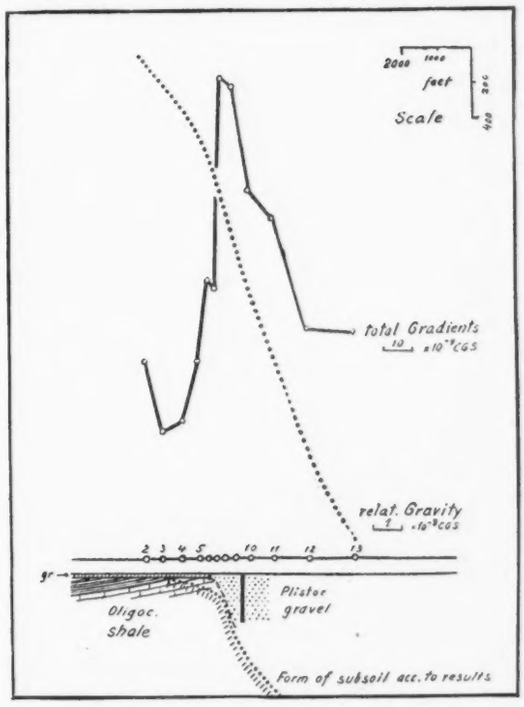


Fig. 6 B—Geological profile showing the total gradients and the relative gravity

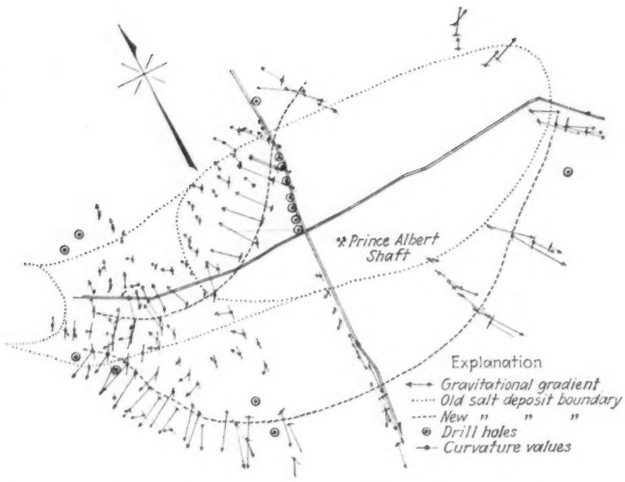


Fig. 7—Measurements obtained by the "Exploration" Gesellschaft above the salt bed at Oldau-Hambühren, taken from the work of G. Tuchel in No. 18 of "Pumpen u. Brunnenbau," 1924

intensity on the same deflection-principle as applied in the portable theodolite, and the vertical intensity by changes in the inclination of a horizontal magnetic needle rotatable round a horizontal axis, suffices where great accuracy is not required. For more accurate measurement the Ad. Schmidt local variometer, made by the Askania-Werke at Berlin-Friedenau, is now used almost exclusively. A local variometer intended for measuring vertical intensity consists, as shown in Fig. 9, of a system of magnets in which a quartz knife-edge rests on two quartz bearing-rests. This system of magnets shows a tilt which is in proportion to changes in the vertical intensity and which is read off by means of a mirror fastened to the apparatus in conjunction with an auto-collimating device.

The local variometer for horizontal intensity (Fig. 10) is based on a similar principle, but in this case the magnet system is set vertically and dips in the magnetic meridian under the influence of the horizontal intensity.

The inclination can be ascertained more simply and more exactly than with the inclination needle, by the use of Schering-Wild's earth inductor (Fig. 11), in which a rotating coil is turned until the current induced by the earth's magnetic field disappears and the axis of the coil comes into the direction of the lines of force, that is, of the inclination. As the earth's field is not constant, but is subject to temporary variations, the latter must be observed on a stationary instrument and eliminated. For this purpose, where declination and horizontal and vertical intensities have to be measured, special variometers are used in conjunction with a recording apparatus. For practical purposes it is more convenient to fit a recording attachment to the local variometers and to connect them with a recording apparatus, as shown in Fig. 12. Fig. 4 shows the effect upon the vertical and horizontal intensities of a few types of magnetic deposits. It will be seen that the vertical intensity stands in the simplest relation to the character of the subsoil, because it is always at its maximum over a south magnetic mass. On the other hand, declination, horizontal intensity, and inclination show the greatest disturbance in the neighborhood of the edges.

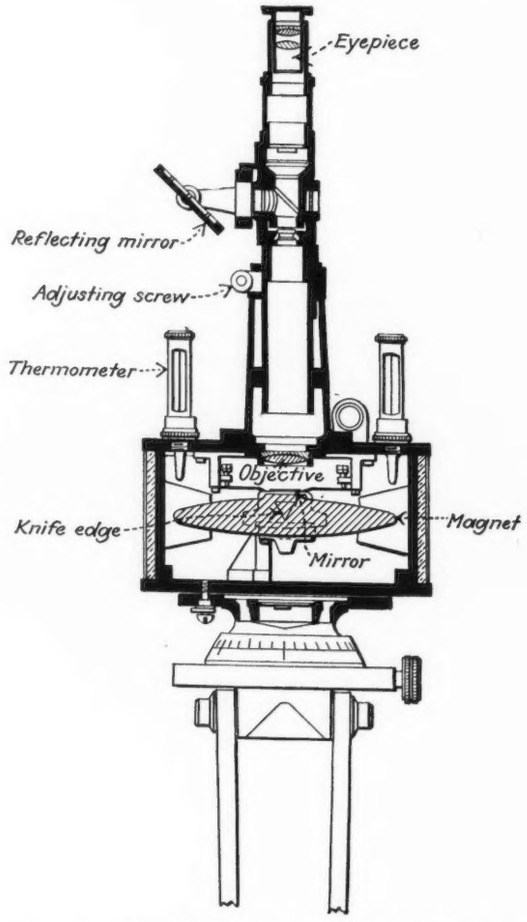


Fig. 9—Vertical field balance as designed by Ad. Schmidt

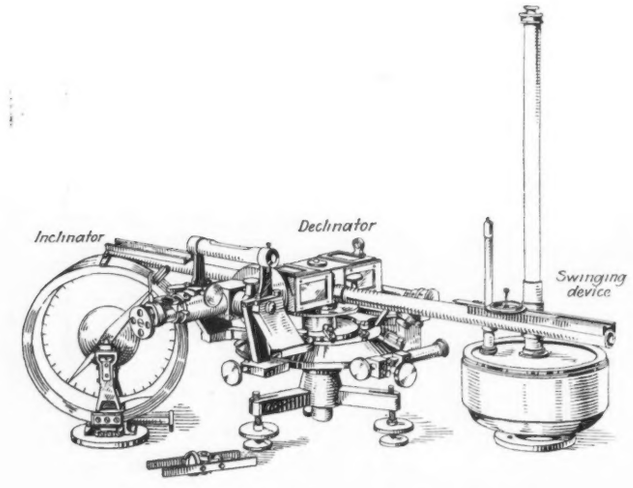


Fig. 8—Magnetic portable theodolite

Magnetic deposits are the ones most readily discoverable by the use of magnetic methods, more especially magnetite, magnetic pyrites, and, next in order, hematite and the rather less active limonite. Salt beds can be located by reason of their non-magnetic properties. By indirect methods mineral oils can be discovered when they occur at the edges of salt beds or in conjunction with magmatic intrusions.

Fig. 13 shows the preliminary results of my magnetic measurements over the magnetite deposits at Berg-

gieshübel, Saxony. East of the Zwiesel adit the deposit suddenly fell away from the line of strike, and a southerly cross-drive failed to relocate it. The comb-line of the vertical intensity anomalies shows beyond doubt, however, that the deposit is thrown to the north, and that the crosscut should have been driven in that direction. In point of fact, thanks to these measurements, the orebody was struck. Fig. 14 gives a sketch in profile of the conditions above referred to. Above the outcrop of the deposit *H* is at zero and *Z* at its maximum. The disturbance vectors are tangential to the

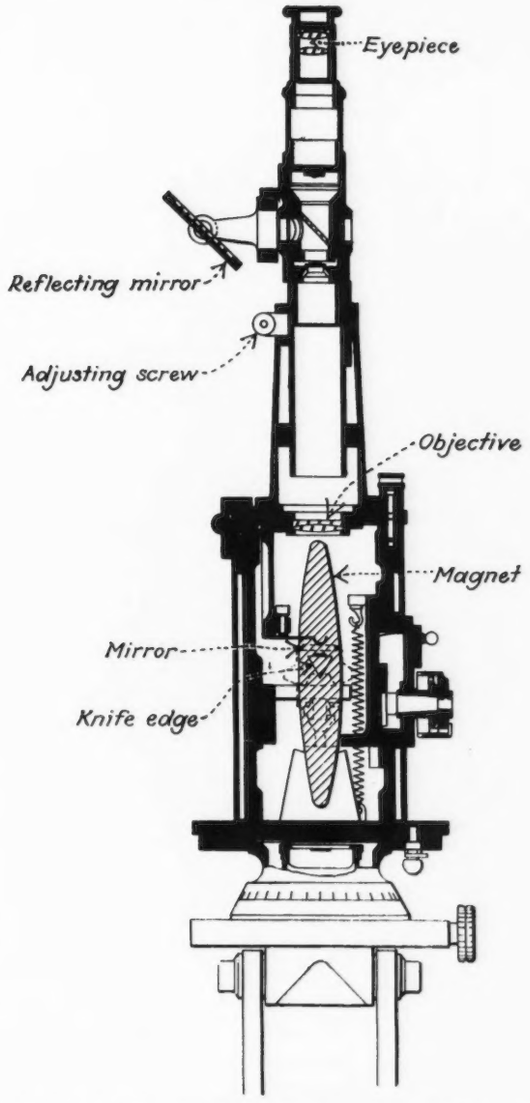


Fig. 10—Horizontal field balance as designed by Ad. Schmidt

lines of force proceeding from the deposit. Fig. 15 represents the results of measurement by F. Schuh above the Mecklenburg salt deposits, which show a minimum of magnetic vertical intensity above the salt beds and especially above the caprock. This result was confirmed by my own measurements at Segeberg and Lüneberg (Fig. 16).

The location of deposits through their thermic action is limited to those cases where indications are already present, especially where borings have been made. By systematic measurement of geothermic temperatures at progressive depths, with the help of maximum ther-

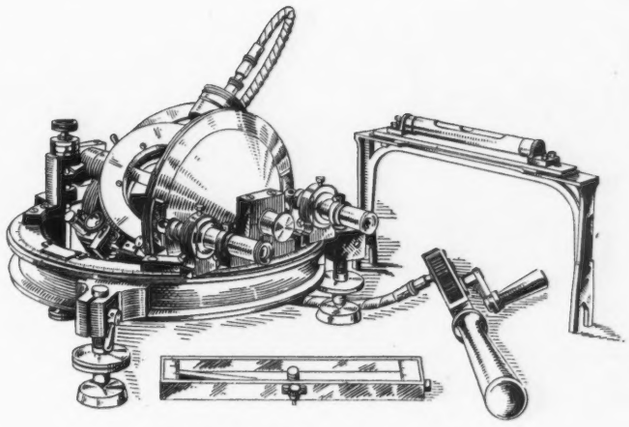


Fig. 11—Rotary inclinator

mometers or recording earth-thermometers, it is frequently possible to gage the proximity of oil and gas horizons and sometimes also of lignite and ores.

There is also not much scope in practice for measurements of radioactivity, on account of the limited range and penetrating power of these radiations. By measuring the distributions of radioactivity on the earth's surface with the help of bottomless ionisation cells and an electrometer, it is possible under favorable conditions to locate faults, and, in the case of borings, clay and oil horizons can sometimes be found by this means.

Methods Using Fields of Force Artificially Produced

Passing now to the second main group of geophysical research methods which are based upon the action exercised by the deposits upon fields of force produced by artificial means, we shall first deal with those measurements in which the observation of elastic waves is resorted to. Acoustic waves can be used, as suggested by Fessenden, or else seismic waves, as recommended by Mintrop. As shown in Fig. 17, Fessenden's process consists of putting down shafts at the corners of the areas to be prospected for deposits (particularly ore deposits), filling the shafts with water, and fitting

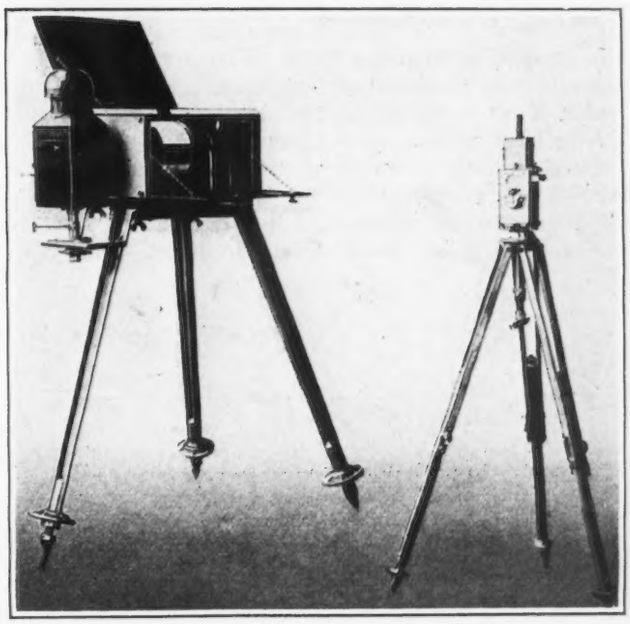


Fig. 12—Horizontal field balance with recording device

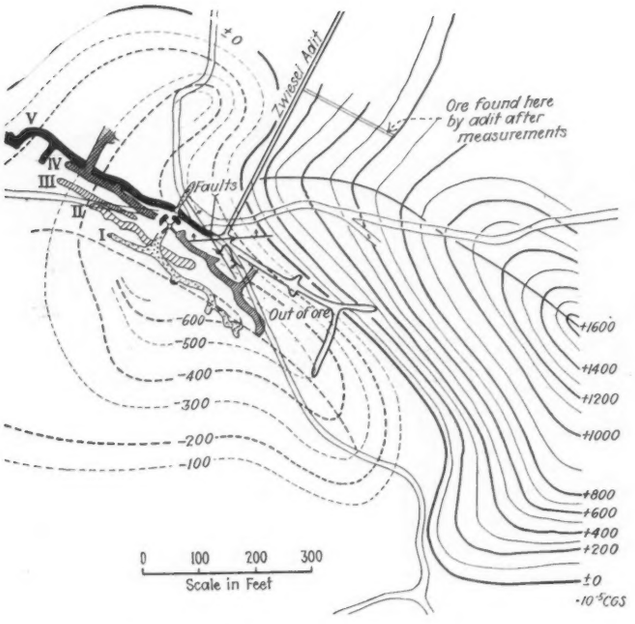


Fig. 13—Measurements obtained by the author above the Berggiesshübel magnetite deposits in Saxony

them with microphones, the current oscillations of which are then recorded by means of oscillographs. One of the shafts is further provided with an oscillator driven by an alternating current generator. The moment at which the oscillator is set in motion is communicated to the four oscillographs through conductors. A part of the resulting sound-wave finds its way direct to individual receivers, and part of it is broken up and deflected so that differently timed impulses are communicated to the several receivers. From the records thus obtained, the path of the sound waves can be deduced.

Mintrop's method, on the other hand, partakes more of the practice which is usual in seismology, and does not necessitate boring in the area prospected. At various points in the district under survey, artificial earthquakes are produced by blasting, and a very sensitive seismometer with a recording apparatus (Fig. 18) is used to register them. The appliance consists essentially of a leaden ball fastened to a thick flat spring, which is set swinging by the shocks. The ball carries a long lever with a small spring which rests against a vertical spindle carrying a mirror, and causes it to revolve. The oscillations of the mirror are recorded by an apparatus within which is a strip of sensitive paper moving at great speed, units of time being

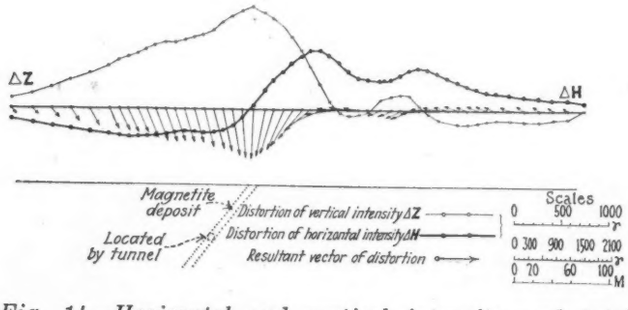


Fig. 14—Horizontal and vertical intensity and total disturbance vectors above a magnetite deposit near Berggiesshübel

marked on it by means of a pendulum. As the seismometer also responds to the sound waves resulting from the explosions, the ensuing record makes it possible, since the speed of sound is known, to establish the precise moment at which the shock took place and also the period of time occupied in transit by the seismic wave. Fig. 19 shows how this period of time is governed by the distance of the point of explosion in the case of certain tectonic formations. As the seismic waves always select the path by which they can most rapidly reach the receiver, it follows that, for example, in the case illustrated in the first sketch of Fig. 19, it will happen at a certain distance that those waves which have selected the longer path through the lower and denser stratum will reach the receiver sooner than those which have taken the direct road through the upper stratum. That occurrence will be expressed by a kink in the curve representing the travel-time of the wave. Much the same thing applies to Case 2 with the vertical limiting surface; whereas, in Cases 3 and 4, the turning point of the travel-time curve coincides with the symmetry axes of the anticlinal and synclinal respectively. Mintrop's method has a wide field of ap-

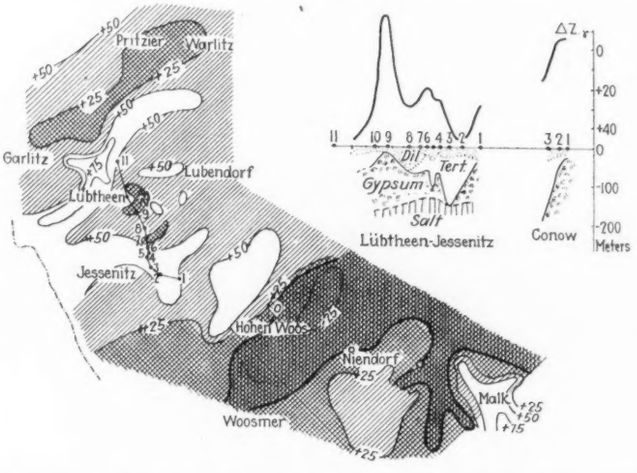


Fig. 15—Measurements obtained by F. Schuh above salt beds in Mecklenburg

plication; almost every kind of stratified deposit occurring in practical geology can be defined by its means.

In ore mining, more particularly, those measuring processes which are based upon the differential spreading of electric currents play a large part. The simplest application of electrical methods consists of resistance measurements. If, for instance (see Fig. 20), it is desired to test whether two offshoot veins or droppers are connected with the subterranean waters, it is only necessary for the points in question to be brought into an electric circuit with a galvanometer, which, if there is direct conductivity, will register an impulse. The so-called equipotential line method, however, is much more widely used. An artificial electrical field is set up in the area under survey by burying at its extremities two electrodes (preferably in the form of lines) and feeding them with continuous or alternating current. The latter is to be preferred, because it will not lead to polarization effects in damp soil, and it should be of about 500 periods and ranging from a few hundred to a few thousand volts. In this way we shall get the distribution of energy sketched in Fig. 21; the equipotential lines run straight and parallel with

the electrodes. If, now, there is a conductor in the area under survey, it will attract the lines of current and will accordingly force the equipotential lines apart, as shown in Fig. 21.

The location of the equipotential lines in the area is effected in the manner shown in Fig. 22. Using the alternating current, two sounding probes are connected by a telephone, a sound-amplifier being interposed if necessary; one probe remains fixed, and the position of the other is constantly changed until the telephone registers no sound. When that is the case, both points are on one equipotential line. It is also useful, however, to know the difference of potential of these lines. To ascertain this, we connect subsidiary sounding probes over a resistance (see Fig. 22, page 55) in order to obtain a fall of potential and lead a connection from the resistance, via a telephone, to one of the sound probes. The position of the probe connection on the resistance at the time when the sound ceases to be heard will make it possible to deduce the difference of potential of the probe in question in relation to the other two. It is best, however, to find equipotential lines having the same difference of potential. To effect this, the resistances at either side of the probe-connection must be equalized on the measuring bridge; points of equal difference of potential having thus been found, the

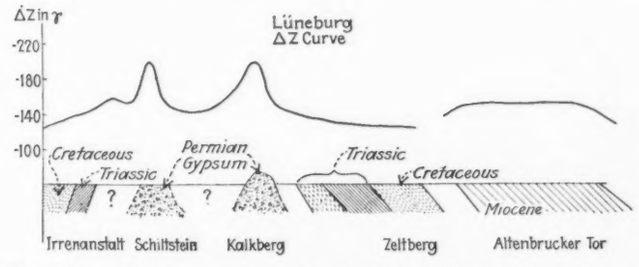


Fig. 16—Measurements obtained by the author above the salt occurrences at Lüneburg

lines radiating from them are further followed up with two sounding probes and a telephone. From the distribution of the potential, it will be possible to deduce the potential gradient, which can be expressed as a multiple of the gradient observed above the normal stratification, and the points at which the multiples are equal are connected by isanomalous lines. Above a conductor, the potential gradient is zero. Above the edges it will be at the maximum.

There is another application of the electrical process in which the current induced in a rotatable coil (Fig. 23) by the field of alternating current generated in the area under survey is measured by means of a telephone (Gella process) and amplifier or voltmeter connected (Lundberg Sundberg method) to a rectifier (detector or audion tubes), the coil being rotated until the minimum or maximum current or sound has been found. The induced current will be at its maximum intensity where the underlying ore deposit is most considerable. If two coils are connected through a telephone, lines of equal intensity can be found in the same way as in the equipotential line method, one coil being movable and its position being altered until the sound disappears. When a coil with a telephone is used (Fig. 23), the winding area, when the sound is at its minimum, will be perpendicular to the direction of the lines of current, which are attracted by conductors. The electrical method is suitable for locating any

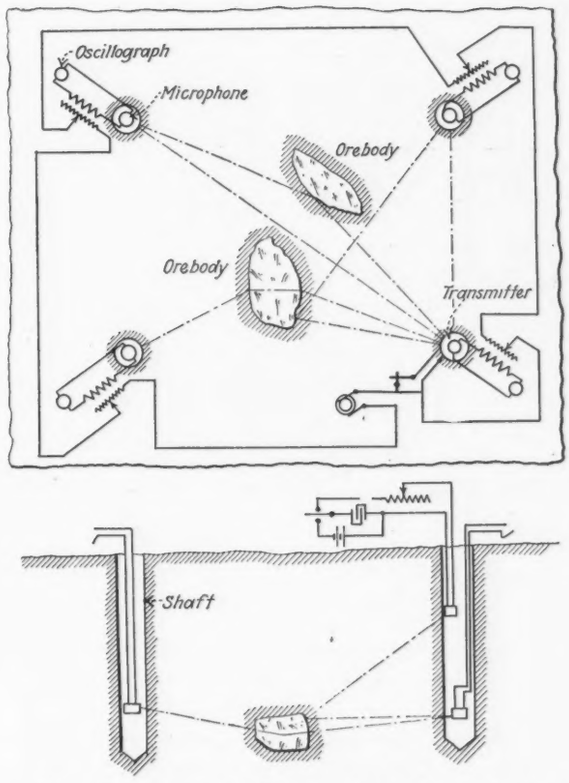


Fig. 17—Diagram showing how Fessenden's acoustic method is used

ores which glitter and also coal, these being good conductors, and frequently also mineral oil, salt, and lignite, which have insulating properties.

As sedimentary deposits conduct parallel to the direction of stratification better than at right angles thereto, questions of tectonics can also be elucidated by this means. In shaft sinking, the process is often used to examine cementations and frozen shaft walls. Figs.

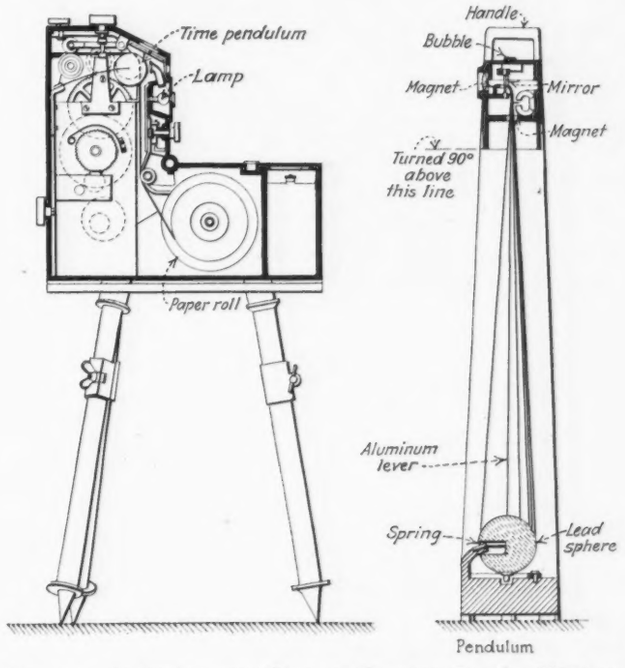


Fig. 18—Seismic recording apparatus by L. Mintrop (reproduced by permission of Dr. L. Mintrop, director of the Seismos G.m.b.H., Hanover)

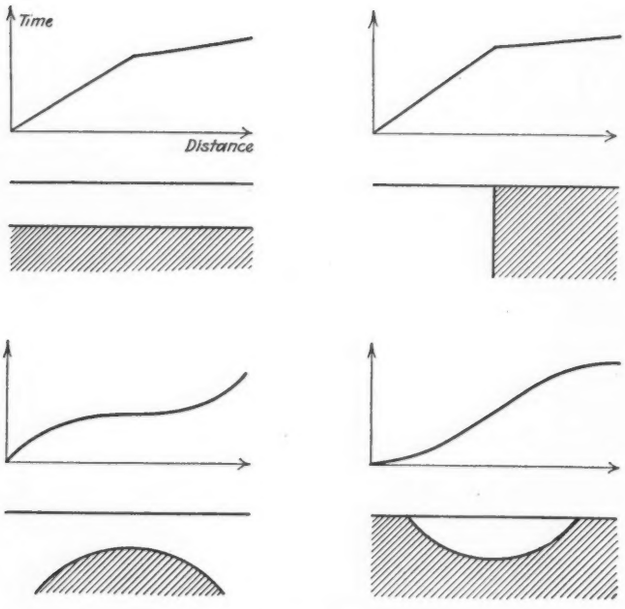


Fig. 19—Diagram of travel-time curves above a few tectonic formations

24 and 25 show the results of measurements taken over the Bjurfors ore field in northern Sweden.

The making of an artificial electrical field can occasionally be dispensed with, though in practice such cases seldom occur, whenever it happens that in a particular area the earth current is strong enough to be measured by means of subsidiary sounding probes and galvanometers, in a manner similar to the equipotential line method. An extra strong earth current frequently coincides with "faults." Many ore deposits, and particularly sulphide ores, act as galvanic elements, especially when their composition shows local variations or when they are connected with electrolytes of different concentrations or with two solutions of different chemical activity. Their location can be established by ascertaining the distribution of current as in the equipotential line method.

Finally, some reference should be made to those methods by which the influence of mineral deposits upon the distribution of electrical waves is ascertained. These methods differ from the electrical methods hitherto described, in that their successful employment depends upon the waves being propagated continuously over non-conductors. They are subject to the same laws as rays of light, as regards absorption, refraction, reflection, and interference. The root of the dielectric constant corresponds to the index of refraction, and the conductors correspond to opaque bodies. The simplest form of application is the absorption method. (Fig. 20). For example, in order to ascertain the composition of the rock formation separating two levels in a salt mine, transmitting and receiving apparatus is set up in the levels, and the nature of the reception will show whether any conductive substances, particularly accumulations of brine, are present between transmitter and receiver or not. A similar purpose is served by the reflection method (Fig. 20, right) in which the path of the radiation between transmitter and receiver, especially when frame aërials are used, will indicate the position of substances containing water. By altering the wave length, interferences can be produced between the radiations transmitted and received (interference method, Fig. 26, right). A certain wave length will be found to give the strongest reception, and from this the position of the conductive stratum can be deduced. In the so-called quarter-wave length method only a transmitter is used, and the maximum reaction is obtained when the distance from the reflecting stratum is exactly equal to a quarter of the wave length in use. The capacity method (Fig. 26, left) is another one in which only a transmitting apparatus is employed. Since the natural frequency of an oscillating circuit depends on the dielectric constant of the strata surrounding the aërial, and the frequency as well as the damping of the oscillations depend on the presence of conductors in the neighborhood of the aërial, the observation of these two values provides a means of obtaining data as to the bodies in the neighborhood of the oscillating circuit.

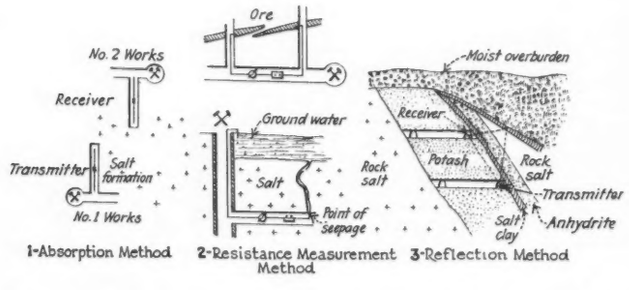


Fig. 20—Investigations of the spreading of electrical currents and waves (from the work of Ambronn "Die Verwendung geophys. Aufschlussmethoden" Jb. d. Hall Verb. III)

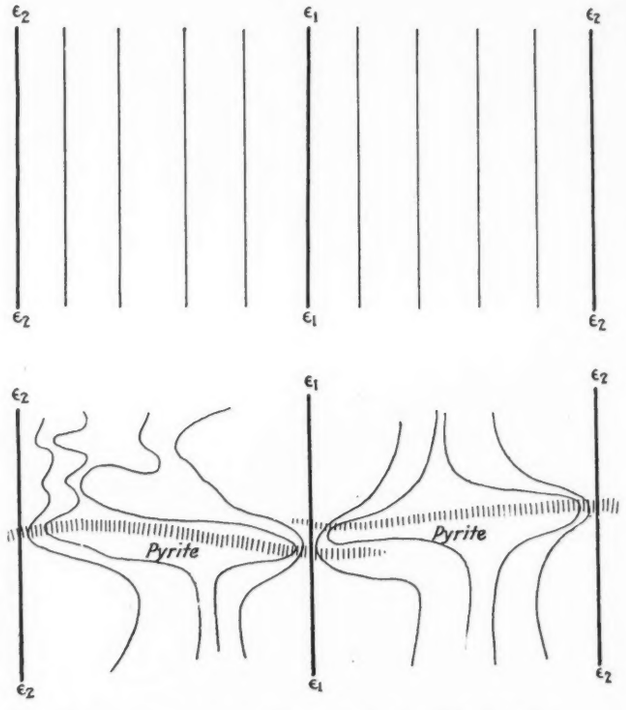


Fig. 21—Distortion of equipotential lines

Above, equipotential lines of a normal field and line contacts E_1, E_2. It is not shown in the drawing that the potential lines are denser at the line contacts. Below, distortion of equipotential lines by pyritic deposits, using contacts E, according to Nathorst and Lundberg.

In dry areas such as deserts, electric waves have been

successfully used for locating ores, coal, and subterranean waters, but in our own latitudes their use is mostly confined to the location of brine accumulations in salt mines and to the examination of cementations and frozen shaft walls.

Geophysical surveying methods are as yet only at the beginning of their development. The results so far obtained, however, encourage the hope that when carried to greater perfection and used to supplement each other, they will eventually constitute a more and more

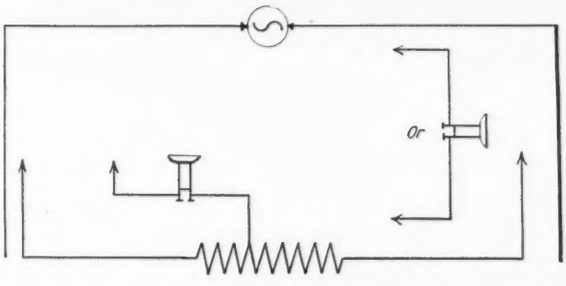


Fig. 22—Finding equipotential lines in the field (from pamphlet by the Erda A.-G. Göttingen)

indispensable part of the equipment of the mining engineer and of the practical geologist.

Following are given a list of reference works, and, on page 56, a systematic summary of the various geophysical surveying methods.

Bibliography

I have given in the following as complete a list of publications relating to instruments and processes used in applied geophysics as the limited amount of space available permits. As this branch of science owes its methods of observation for the most part to geophysics pure and simple, those works dealing with geophysics alone, of which the study is advisable in order to get a complete grasp of the various methods, have been included.

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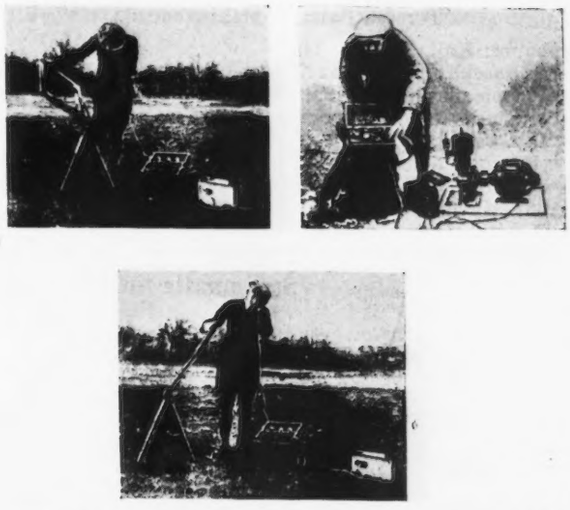

Fig. 23—Determining the lines of current by the Gella method (lent by the Elbof Gesellschaft, Cassel)

Above, left, measuring magnetic field with receiving apparatus. Above, right, sending station with battery or generator. Lower, reception with receiving apparatus.

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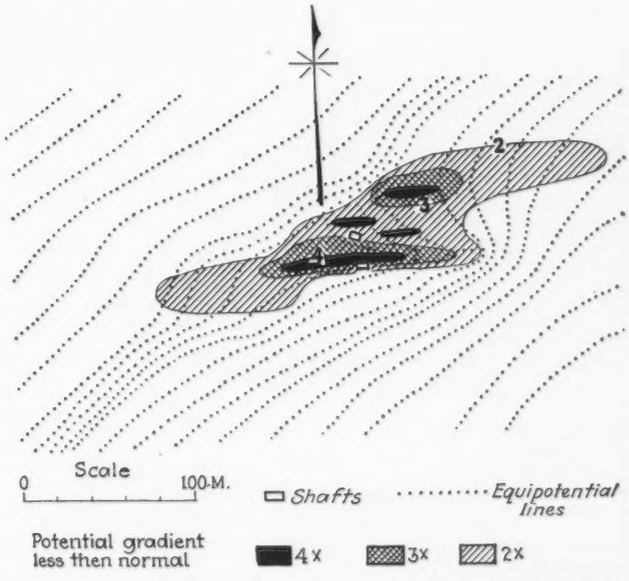

Fig. 24—Equipotential lines, also isanomalous gradient lines, on the Bjurfors ore field, reproduced from Lundberg's "Practical Experience in Electrical Prospecting," 1923

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Systematic Summary of Geophysical Methods of Survey

I. Measurements of natural action

Measurements of	Apparatus	Subject of Measurement	Manifestation of Disturbance	Application
A. Field of Gravity 1. Pendulum measurements.	4-Pendulum apparatus	Relative force of gravity	g = maximum over heavy masses	
2. Observations of plumb-line deviations	Universal instruments	Geodetic and astronomical latitude and longitude	Attraction of the bob of the plumbline by heavy masses	Tectonic mass formations
3. Torsion balance measurements	Eötvös torsion balance	Gravity gradients and curvature values	Gradient at its maximum and variation of the main direction of curvature } above the edges	Ores, salt beds, lignite, hidden tectonic formations, valley profiles and (by indirect application) mineral oil
B. Magnetic field	Portable theodolites	Declination, horizontal intensity, inclination	Declination, horizontal intensity and inclination maximum and minimum over edges	Magnetite, magnetic pyrites, hematite, limonite, salt ridges; by indirect application mineral oil.
	Local variometers (magnetometer)	Vertical intensity Horizontal intensity	Z Max. over south magnetic mass Z Min. over north magnetic mass See above	
	Inductors	Inclination (also H and Z)	See above	
	Variation instruments	Declination, horizontal intensity, vertical intensity		Elimination of variations
C. Thermic Action	Maximum and recording thermometers	Geothermic depth measurements	Shortening of the scale of depths near the source of heat	Mineral oil, gas, lignite, and certain ores
D. Radioactivity	Electroscope	Relative ionization	Increased radio-activity over disturbances	Faults, clay and oil horizons

II. Measurements of reaction to external influences of artificial character

Measurements of	Apparatus	Subject of Measurement	Manifestation of Disturbance	Applications
A. Reaction to Elastic Waves 1. Acoustic measurements	Oscillators, microphones	Travel-times over the direct path, refraction and reflection	Form of the travel-time curve and path of rays.	Ores
2. Seismic measurements	Vibrographs and explosives	Travel-time (propagation speed)		Ores, coal, salt, covered tectonics
B. Reaction to electrical currents 1. Simple resistance measurement	Circuit and galvanometer	Resistance of circuit	Current in the case of conducting connections	Connections between accumulations of brine and offshoot veins of ore
2. Laying out an artificial electrical field	Generators, sounding probes, telephones	Equipotential lines	Conductor forces equipotential lines apart	Glittering ores, coal (good conductors); Mineral oil, salt, lignite (bad conductors): Covered tectonics (stratification) cementations, frozen shaft walls
	Coil frames	Direction and intensity of electromagnetic field	Position of winding area when sound is at minimum is perpendicular to the direction of current lines attracted by the conductor	
	Coils	Lines of equal intensity	Intensity = max. over conductors	
3. Use of Earth Current a. Influence exerted upon natural earth current b. Electrochemical action	Auxiliary sounding probes with galvanometer	Equipotential lines	a. Greatest distance between lines above conductors b. Disturbance most frequently at centres of curves	a. All glittering ores faults b. Most sulphide ores
C. Reaction to Wireless Waves 1. Absorption methods	Transmitter and receiver	Nature of reception	With conductors between transmitter and receiver no reception	In dry districts { Ores coal water Elsewhere: Accumulations of brine Cementations Frozen shaft walls
2. Reflection methods	Transmitter and receiver	Path and direction of radiation	Conductors reflect and act as screens	
3. Reflection and interference method; ¼ λ method	Transmitter and receiver or only transmitter	Variation of reception strength with the wavelength	Maximum reception When distance = λ/4	
4. Capacity method	Transmitter	Variation in capacity—i. e., in frequency (or λ) and damping	Substances with a high dielectric constant increase capacity (good conductors increase capacity and damping)	

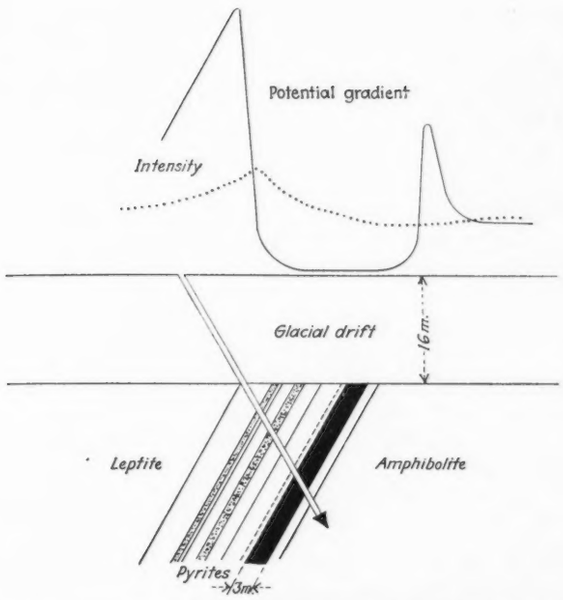

Fig. 25—Gradient of potential and intensity of induction above one of the lodes in the Bjurfors ore field (id. ibid)

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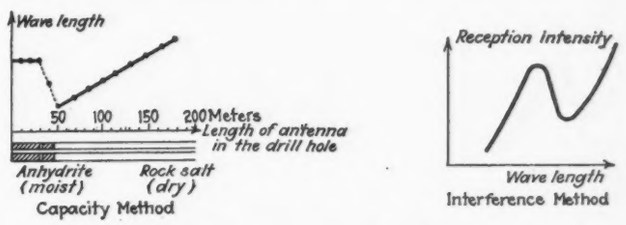

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How a 200 to 1 Shot Won

Prospector Regains Lost Property with Aid of Friend's $50, and Pays Back $10,000—Contract Upheld by Court

By Leslie Childs
Greenfield, Ind.

A RETURN of $10,000 for an advancement of $50 will be conceded to be large, and to the layman may appear beyond the bounds of reason. However, contracts of this kind are not uncommon in the mining world, where the risks are great, and in the absence of fraud will, under proper conditions, be upheld by the courts. As an illustration of judicial reasoning in situations of this kind the Washington case of Embola vs. Tuppela, 220 Pac. 789, may prove of interest and profit.

In this case John Tuppela went to Alaska during a gold rush and located mining property which proved of great value. After remaining in Alaska several years, he was adjudged insane and committed to an asylum in Portland, Ore. Tuppela was released from the asylum about four years later, and he then ascertained that his guardian in the meantime had sold his mining properties.

Following this, in 1918, when Tuppela was destitute and without work, he met Henry Embola, who had been a close friend of his for about thirty years. Embola advanced money for his support and rendered other services in the capacity of a friend. During this period, it appears, Tuppela had requested a number of people to advance money for an undertaking to recover his mining property in Alaska. However, he was unable to find any one who would make an advancement for that purpose and he was advised by an attorney that he could not recover the property in any event. At this stage of the case Tuppela made the following statement to his friend Embola:

"You have already let me have $270. If you will give me $50 more so I can go to Alaska and get my property back, I will pay you $10,000 when I win my property."

Embola accepted this proposition, advanced the $50, and Tuppela went to Alaska. After extended litigation Tuppela recovered his property, which was of the estimated value of $500,000. Then Tuppela remembered his promise, and requested his trustee to pay Embola the full amount. The trustee declined to pay such an amount and Embola filed an action to enforce payment. In defense of this action the trustee, or guardian of Tuppela, argued that the amount advanced by Embola was a loan, and that it was not an adequate consideration to support a repayment of the sum of $10,000; that a loan of this small amount conditioned on the payment of $10,000 was usurious, and should not be enforced against the property of Tuppela. In reply to this, Embola contended that the money he advanced to Tuppela was not a loan but an investment, in the nature of a grubstake contract which should be upheld. The trial court took this view of the matter and rendered judgment in favor of Embola. From this judgment an appeal was taken to the U. S. Supreme Court at Washington, which, in reviewing the record and passing upon the questions raised, said, in part:

"This is not a case wherein respondent [Embola] advanced money to carry on prospecting. The money was advanced to enable appellant [Tuppela] to recover his mining property. Appellant had already been advised by an attorney that he could not recover this property. The risk of losing the money advanced was as great in this case as if the same had been advanced under a grubstake contract. Where the principal sum advanced is to be repaid only on some contingency that may never take place, the sum so advanced is considered an investment, and not a loan, and the transaction is not usurious. . . ."

Court Rules Transaction a "Fair Contract"

Following the above disposition of the question of the transaction constituting usury, the court directed its attention to the question of the adequacy of the consideration. In this connection the court, among other things, said:

"The fact that the money advanced was not to be returned until appellant won his property, a contingency at that time unlikely to occur, supports the finding that the consideration was not inadequate. To the contention that the contract was procured through fraud the testimony shows that appellant voluntarily offered to pay the $10,000, and at the time was of sound and disposing mind, and considered that the contract was fair and to his advantage.

"The trial court having found that there was no fraud, and that the contract was not unconscionable, we should uphold these findings unless the evidence preponderates against them. . . . We are satisfied that the evidence supports the findings. . . ."

In conclusion, the court affirmed the judgment rendered in favor of the respondent, Embola, holding, as outlined in the opinion, that in view of the nature of the contract, its freedom from fraud, and the risk of losing the money advanced, the respondent was entitled to repayment in the sum of $10,000, for the advancement of $50, in accordance with the terms of the agreement.

Discussion

Exploration at Meteor Crater

THE EDITOR:

Sir—I was much interested in your editorial, entitled "Mining for Shooting Stars," in the issue of Dec. 26, 1925, and have thought that you might like some additional information on the subject.

You are right in saying that exploration was unsuccessfully conducted there, first by the Standard Iron Co., under my direction, and later by the Crater Mining Co. The work of the latter company, however, cannot be dismissed as "unsuccessful" without an explanation. This company undertook not to mine the mass, but simply to drill a number of exploratory holes in the southern rim of the crater to discover and, if possible, delimit the deeply buried meteoric mass, the origin of the crater having been proved beyond all question. To this end the company appropriated a certain sum of money, which, owing to the great difficulties of drilling in the broken and crushed formation above and around the cluster of meteorites, was greatly exceeded before the first hole had been completed. Eventually this hole (which was sunk through the south rim, it having been determined that the mass approached from the north at an angle of approximately 45 deg.) encountered what is beyond doubt the upper part of the buried cluster of iron meteorites, finding it in exactly the predicted position. The majority of the directors of the company, taking into account the difficulties of drilling and the amount by which they had already so greatly exceeded their estimate of the cost of the exploration, were unwilling to go to the further extent of spending a quarter of a million dollars in sinking a shaft, which had been shown to be the only feasible way of proceeding further with the exploration. The work of the company, therefore, though it was unsuccessful in mining the meteoric mass, was successful in locating the hidden meteor and in pointing the way for future exploration. This is the opinion of very eminent men who have critically considered all the facts.

You indicate that the hope of profit in mining the mass is due to the fact that it is largely iron. In this you are misinformed, for the iron as iron would be of little value. It contains, however, (as do all iron meteorites) enough nickel to render it a valuable ore—from 5 to 6 per cent—and a small but valuable amount of some of the platinoid metals. The combination makes the "ore" of high grade, and one which would fully justify the rather high costs of mining and smelting it. It must not be thought that there is expectation of mining solid iron, however, although it is probable that there may be scattered masses of it in the great compact cluster which made the crater. This for the reason that the greater part of the iron, owing to the presence of a small amount of chlorine, is highly oxidizable, and there is strong probability that most of the cluster has been converted into hematite or limonite since the fall. This is borne out by a great deal of evidence and especially by that afforded by the last drill hole, which brought up a considerable quantity of iron oxide, carrying nickel but with no trace of metallic iron. Water ran freely out of the bottom of the hole at a depth of 1,376 ft., at which point the drill became irretrievably stuck in oxidized meteoric iron admixed with sandstone fragments.

As Professor Elihu Thomson, of the General Electric Co., and Professors Magie and Russell, of Princeton, will tell you, the facts, once they are fully understood, are very simple, after all, and are easily interpreted. The phenomena of this great so-called crater are not really more difficult of interpretation than the effects of a rifle bullet from a high-powered rifle, held at an angle of about 45 deg. from the horizontal (or, better still, a charge of shot from a shotgun so held at very close range) fired into stiff clay. The impacting mass of meteoric iron, as has been stated in my final scientific paper on the subject,[1] has been located just where I predicted in a paper, published in 1909,[2] that it would be found; that is, under the southern wall of the crater.

Philadelphia, Pa. DANIEL MOREAU BARRINGER.

Peace on Earth, Good Will Toward Men

THE EDITOR:

Sir—It is the fashion in America to speak in derogatory tones of Britain.

It is a matter for sincere regret that a mining journal of international authority joins the abusive chorus.

I take it, sir, your mission is to preach better mining methods, to criticise adversely when criticism is justified—in mining.

The people of this country, through fault and default of other nations, must take huge sums annually from their own pockets and transfer to yours.

They labor under a terrible burden of unemployment. They are the world focal point of Bolshevik attack. They carry on. Yet—they are a drunken, dissolute, decadent lot in American eyes.

Americans should study the latest drink statistics of this country and St. Luke, Chapter VI, paragraph 41.

Englishmen as a race are travelers and administrators of vast foreign territories. English readers of *Mining Journal-Press* are men whose very jobs have compelled years of residence overseas. Yet—through your spectacles—they are a race apart from the American, Canadian, Australian, South African—they are crude, uncouth, wielders of clubs. Vide *Journal-Press*, page 843, Nov. 28.

Why not start the new year with a little human sympathy for this Mother of Nations?

Let sarcastic and jingoistic racialism be clearly swept from all and every journal, and thus inculcate an era of international friendship. A. T. HOLMAN.

Camborne, England.

[1] "Further Notes on Meteor Crater in Northern Central Arizona" (No. 2).

[2] "Meteor Crater (Formerly Called Coon Mountain or Coon Butte) in Northern Central Arizona."

Consultation

Specifications and Prices for Manganese

"Please put me in touch with some companies who are interested in manganese ore. I would like to have the specifications of ore to meet the demands of the market. What is the average price paid for the ore?"

"Will you kindly give me the names of the companies producing ferromanganese and spiegeleisen in the eastern part of the United States? I have large quantities of ore that will assay 47 per cent manganese."

The purpose for which ore is to be used, and therefore the market, depends upon the character of the ore. "Chemical" ore should be high in oxygen, may contain considerable phosphorus and silica, and be low in lime. Specifications require at least 70 and preferably 80 per cent manganese dioxide, with iron under 2 per cent, copper under 0.02 per cent, and cobalt, nickel, and arsenic should not be present in appreciable quantities. The principal uses are in the manufacture of dry batteries, paints, and chemicals.

"Metallurgical" manganese ore is far more important from the standpoint of tonnage. Ore high in lime and low in oxygen, phosphorus, and silica comes in this class. To be able to produce 80 per cent ferromanganese, the iron content must not be too high. The grade of ore usually specified in contracts is 50 per cent metallic manganese dried at 212 deg. F. For the manufacture of ferromanganese and spiegeleisen, which are the important uses for "furnace" ore, the physical characteristics are important. Hard ore in medium-sized lumps is desirable; fine and soft ores are objectionable in the blast furnace.

Manganese ore is usually purchased on the basis of the long-ton unit (22.40 lb.) of metallic manganese. The following table gives a typical settlement schedule, carload lots, f.o.b. furnace:

Manganese, per Cent	Iron, Maximum, per Cent	Silica, Maximum, per Cent	Phosphorus, Maximum, per Cent	Cents per Unit
50 and over.....	5	12	15	68
48 to 49.99	5	12	15	65
46 to 47.99	6	13	15	60
43 to 45.99	6	14	15	50
40 to 42.99	5	14	15	45

For each 1 per cent of silica in excess of the maximum stipulated there shall be a deduction of 25c. per gross ton.

For each 1 per cent of iron in excess of the maximum stipulated, there shall be a deduction of 25c. per gross ton.

The following figures give the prices of ferromanganese and spiegeleisen per long ton during recent years and reflect the fluctuations in the value of manganese ore:

Year	Ferromanganese	Spiegeleisen
1918	$250.00	$78.72
1919	132.16	42.03
1920	172.33	70.11
1921	79.53	31.25
1922	74.22	34.31
1923	114.85	42.87
1924	102.79	34.39

During 1924 the price of manganese ore per long-ton unit of manganese ranged between 38 and 46c. The current price is from 40 to 42c. per unit.

The following firms are users of manganese ores:
Charles Cooper & Co., New York.
National Sales Corporation, Cincinnati.
American Manganese Manufacturing Co., Dunbar, Pa.
Brown, de Courcy, Inc., New York.
Crocker Bros., New York.
Electro Metallurgical Sales Corporation, New York.
Hickman, William & Co., New York.
E. J. Lavino & Co., Philadelphia.
C. W. Leavitt & Co., New York.
Shimer & Co., Philadelphia.
Southern Manganese Corporation, Anniston, Ala.
U. S. Ferro Alloys Corporation, New York.
Waldo Egbert & McClain, Inc., Buffalo.

Lead Wool

"What is lead wool and what is it used for?"

When metallic lead is prepared in a fibrous or shredded form, loosely twisted, the product is termed lead wool. The fibers are the size of small threads. Among the principal uses are (1) for calking joints in cast-iron pipe lines and pipes subject to vibration; for holding bolts and expansion bolts in walls and floors; for stopping leaks in pipes, brick sewers, or skylights; and for making emergency repairs in plumbing.

The advantages of lead wool for calking joints in cast-iron pipes are claimed to be important. The process is said to have passed the experimental stage. The wool does not require melting, and is said to make a better joint than hot lead and in less time. The work can be done under water, in wet ground, or during a rainstorm. The waste due to the melting and handling of molten lead is eliminated, and the cost per joint is said to be lower than when molten lead is used because of economy of metal.

Zinc Carbonate

"Will you kindly inform me in regard to the uses, consumption, and value of pure zinc carbonate precipitate?"

Zinc carbonate is used in the manufacture of medicines and as a pigment. It is grouped in government reports with the minor compounds of zinc, the estimated value of all of them used in one year being $400,000. The product in wooden barrels or tins is quoted at 13 to 15c. per pound at this time.

Copper Free Since 1894

"When was the tariff on copper removed?"

The duty on copper ore was removed in the Wilson tariff act of 1894, during the second administration of President Cleveland, since which time it has been on the free list. Prior to 1894, the ore was dutiable on its copper content. The tariff of 1883 had a duty of 2½c. per pound of fine copper; this was reduced to 1c. in the act of 1890.

News of the Week

The Mining News of ENGINEERING AND MINING JOURNAL-PRESS is obtained exclusively from its own staff and correspondents, both in the United States and in foreign fields. If, under exceptional conditions, material emanating from other sources is published, due acknowledgment and credit will be accorded.

Summary

RED LAKE district, in Ontario, attracts many prospectors; large corporations also interested—Three months' extension given for first year's assessments work.

Joplin-Miami district produced 800,000 tons zinc concentrate during 1925; Federal the largest shipper; Eagle-Picher second.

Colorado launches ambitious plan for financing mineral development and stimulation of mining industry; Leadville production increases 33 per cent—San Juan again active—Colorado Springs has new stock exchange.

Transportation the basis for Alaskan development; Alaska Roads Commission asks $1,700,000 for road work in 1926.

British Columbia Silver Mines, Ltd., developing large orebody—Big Missouri Mining Co. organized to take over mine in British Columbia.

Empire Mines, Utah, extends shaft to 2,350 level—Chalk Mountain silver-lead mine, in Nevada, leased.

South Dakota conducts successful tests on "blue ores"—Homestake company mines and mills 1,600,000 tons of ore in year.

Rhodesian Congo Concessions developing large copper deposit—Anglo-American syndicate acquires silver-lead property in Nigeria.

Utah Copper Co. files condemnation suit against estate of E. A. Wall—North Butte and Toulumne Copper companies merge.

British Columbia Silver Mines Develops Large Orebody

At the annual general meeting of British Columbia Silver Mines, Ltd., held at Vancouver on Dec. 18, Charles A. Banks, president of and consulting engineer for the company, gave out further particulars about the oreshoot that the company is developing from the No. 3 level. He stated that a drift had been driven on the shoot for 200 ft. Diamond drilling indicates that the shoot extends for at the least 230 ft. above No. 3 level; as yet, the remaining 420 ft. to the surface has not been explored. Illustrating the importance of the development, Mr. Banks stated that, "based on the values found in the drift, each 100 vertical feet on the length of the shoot may be expected to contain in round figures half a million dollars in gold and silver. The diamond drill points to the existence of other important shoots near to this shoot, which is in the center of the company's territory. On another shoot, which has been mined in the Premier mine and which dips into British Columbia Silver's property, seven holes have been bored to a depth of 400 ft.; these holes indicate the existence of a shoot 250 to 300 ft. long.

The Selukwe Mining & Finance Co., which is holding company for British Canadian Silver Corporation, which, in turn is holding company for British Columbia Silver Mines, recently announced that, owing to the comparatively small area owned by British Columbia Silver Mines to the north of the Premier Gold Mining Co.'s property, it was feared that the company might not reap the full benefit of the development and exploration that it was doing. It was considered advisable, therefore, to introduce the Sebakwe Corporation, which has acquired the Bush Mines, twenty-four claims of which are believed to contain the northern extension of the Premier ore-zone for a mile beyond British Columbia Silver's northern boundary. The authorized capital of Sebakwe is £200,000 in 1,600,000 shares of 2s. 6d. each; 600,000 shares have been given to Bush Mines in payment for the property, and the arrangement carries the obligation to spend $100,000 in development. The Selukwe company has subscribed for 400,000 shares in Sebakwe and has taken a two-year option on another 400,000 at par. Selukwe, therefore, now controls British Columbia Silver and Bush Mines.

"New Broom" Flag Awards Made in Safety Contest

FOUR MINES in the Joplin-Miami district operated more than 10,000 consecutive man-shifts without a lost-time accident during 1925, and were awarded the "New Broom" flags. They were the Barr mine of the Vinegar Hill Zinc Co., the Goodwin of the Eagle-Picher Lead Co., the Muncie of the Federal Mining & Smelting Co., and the Wilbur of the Commerce Mining & Royalty Co. The competition among miners for "New Broom" flags has been keen, and it is conceded the plan has helped materially in accident reduction. The Muncie mine has worked more than 15,000 man-shifts without a lost-time accident. The flag was described in the *Journal-Press*, Oct. 10, 1925, page 585.

Smelter Operations at Chihuahua Yield $1,100,000 Income

An entire absence of labor troubles and the prevalence of other favorable conditions enabled the American Smelting & Refining Co. to do the most profitable business in its history during 1925 in the operation of its mines and smelters in Mexico. The net income of the company's plant at Chihuahua alone was approximately $1,100,000 for the year. During the latter part of the year only six of the eight furnaces of the plant were operated. The daily capacity of the six furnaces aggregated 1,400 charged tons, which included the ore, limestone, and copper matte. The copper matte used for this purpose is of too low grade to ship, and it is put through the smelter a second time to extract what values it may contain. Each 1,400-ton charge contains about 150 tons of copper matte and 15 tons of limestone. A small amount of scrap iron also is used.

The high price of lead during 1925 served greatly to stimulate this branch of the mining industry in Mexico. In various mining camps of the states of Chihuahua and Durango slag dumps from ancient smelters were found profitable to ship to the smelter for the recovery of lead values. During last year there also was a general revival of mining activities in the territory tributary to the smelter at Chihuahua. The plant receives most of its ore from mines in Santa Eulalia, Santa Barbara, and Parral.

The electric power for the operation of the company's smelter is received over high-tension wire from the hydro-electric plant of the Mexico Northern Power Co. at Boquilla, 90 miles distant. The smelter also is equipped with an auxiliary steam plant. The average

number of laborers employed is 1,200, and their wages range from 75c. to $6 a day. Only one person, however, receives the latter high wage, and he is a semi-skilled laborer. It is stated that the labor situation here and at the other smelters of the company was more harmonious and satisfactory during 1925 than any time since 1910. Relations between the company and the several state and federal authorities are all that could be desired.

Reconstruction and enlargement of the company's smelter at San Luis Potosi will be finished some time this year. The old plant at Aguas Calientes has been practically dismantled and much of its machinery and equipment have gone into the smelter at San Luis Potosi. The smelters of the American Smelting & Refining Co. at Monterey, Matehuala, and Asarco were operated during 1925 with practically no interruption. Their earnings are reported to have been unusually large.

The lead bullion from the smelter here is shipped in part to the refinery of the Peñoles Mining Co. at Monterey and in part to the American Smelting & Refining Co.'s refinery at Perth Amboy, N. J.

Colorado Springs, Colo., Has New Stock Exchange

The new Colorado Springs Stock Exchange, which takes the place of the old Mining Exchange, began operations recently, with new officers and directors. Eugene P. Shove is president, and vice-presidents are A. G. Sharp, Irving Howbert, and Willis R. Armstrong. C. M. Balkam is secretary.

The membership has been limited to twenty-five. There are nineteen charter members in the association at present, consisting of members of the old association who are duly licensed brokers.

Colorado Lead and Zinc Ores Treated Outside of State

It is the consensus of opinion that the costs for mining in Colorado are high, but it is firmly believed that lead and zinc under the new flotation process will make millions for those who have access to ores, and who are willing to work. George Collins, a mining engineer of Denver, speaking about the past and present, sounds a timely warning for the Colorado mining industry: "Unless Colorado smelters and electrolytic plants align themselves with the economic battle front, the lead and zinc ores mined in the state will go for treatment to the smelters and refining plants where they can be converted and made commercially usable at the least cost and to the greatest advantage. Just now the Colorado lead and copper ores go to Utah for refining; the zinc goes from here to Montana. The states named have taken the lead in the refining business and will not let loose very easy; hence the need of co-operation between the refining plants of Colorado, and the reasons why, to make a success of mining in Colorado, the necessary smelters and refiners must work as a quasi-mutual aid. If this is done all will get their share."

Calumet & Arizona Has Promising Future

According to George A. Newett, a director of Calumet & Arizona, the mines of this company are looking better today than at any time in the last fifteen years, and he adds that the property "never presented a discouraging appearance." Mr. Newett writes at length on Calumet & Arizona ore developments and prospects in his publication, *The Iron Ore*, at Ishpeming, Mich.

In addition to its present large reserves of ore, Calumet & Arizona, Mr. Newett says, still has a big acreage of land to be explored, most of it lying in the trend of the ore formations that have been so productive in the Warren district.

The Junction shaft is the heaviest producer of ores for the company, and promises to hold this distinction for a long time, as its reserves are extensive. Ore developments in the Campbell shaft, in Junction territory, are described as spectacular. The size and high quality of the deposits will be important in keeping up the grade at the smelter and in permitting areas of lower-grade ores to be mined and smelted. A great development in this portion of the Junction property is expected. On the 15th level of the Junction mine considerable copper is being secured by precipitation on waste iron.

At the New Cornelia property, the new concentrating mill is operating under capacity on account of the low price of copper. The plant was built to treat 5,000 tons a day, but can nearly double this tonnage if necessary. The leaching plant is still being operated and will be for several years, as there is a considerable tonnage of carbonate ores to be treated by this process.

In the big pit at New Cornelia, ore is loaded directly into railway cars by steam shovels. This method will be employed for many years before resorting to any plan of underground mining. The commercial-grade ores of this pit, as proved by numerous drill holes, go downward more than 400 ft. in places, and a number of holes did not go out of ore. There is considerable territory near the pit which, it is expected, will add substantial values to present reserves.

The Eighty-Five mine of Calumet & Arizona, which is located at Lordsburg, N. M., furnished the much-needed silica for the smelting plant. The ores also carry values in copper, gold, and silver, which help largely in paying the cost of mining and transportation.

Colorado Launches Ambitious Plan to Stimulate Mining

Plans for financing and placing in operation the Mines Development Corporation, the greatest co-operative mining project ever attempted in Colorado, were laid before forty of the state's most prominent business men at a dinner at the Brown Palace Hotel Dec. 30, 1925. The plans were discussed by men familiar with the mining industry as it existed during the boom days of Colorado and as it stands today at the beginning of a substantial revival.

The plans provide for the development of mining in Colorado on the most comprehensive scale ever attempted. It is not the purpose of the co-operative corporation to purchase mines, but to lease old properties that give promise of revival and eventually to develop entire new districts. No one section of the state is to be benefited at the expense of any other, but the activities of the corporation will be extended to every locality where development work gives promise of reward.

Definite action resulted in naming fifteen men as directors of the corporation to carry on the work of raising and expending the $10,000,000 for which the project will be incorporated.

The plan of financing the corporation calls for the issuance of 100,000 shares of stock of no par value, the stock to be sold; however, at $100 a share. Subscriptions will be so arranged that the payment may be made yearly or quarterly and may be extended over a five-year period.

Plan Widely Indorsed

Indorsement to the plan, which was originated by George A. Stahl, already has been given by the Denver Chamber of Commerce, the Manufacturers Association, the Denver Real Estate Exchange, bodies of a similar character throughout the state, and by widely known business men, it was announced.

N-T-U Company Closes Contract for Sale of Shale Oil

The Associated Oil Co. of California on Dec. 19, 1925, executed a formal contract, in confirmation of the existing agreement between the companies, covering the details of the purchase of shale oil up to 10,000 bbl. daily from the N-T-U Co.'s extraction plant near Santa Maria, Calif. Under this contract, the average Kern River oil field prices for fuel oil of similar gravity are to be paid for all oil delivered.

The marketing contract under which the Associated purchases the N-T-U product covers the entire output of its Santa Maria plant up to 10,000 bbl. daily.

The N-T-U Co.'s pilot plant of forty tons' daily capacity has been in commercial operation at this point for the last two years, using a simple, internal-combustion process of distillation, fully protected by patents. The operating costs are considerably under the market price of well oil.

The Bethlehem Shipbuilding Corporation has just completed the erection of three additional forty-ton units at the plant, which will be in operation in January.

Recent announcement has been made of the contract under which the Bethlehem Shipbuilding Corporation is to complete the construction of the first 1,000-ton section of this N-T-U Co. 10,000-ton plant. This work is under way at the San Francisco works of the Bethlehem Shipbuilding Corporation, and will be completed as speedily as possible. The Associated Oil Co. will immediately build a pipe line for the N-T-U Co. to handle the early production of 1,000 bbl. per day.

Washington News

By Paul Wooton

Special Correspondent

House Committee to Investigate Foreign Tin Control

The subcommittee of the Interstate and Foreign Commerce Committee of the House of Representatives, which will investigate the foreign control of tin and other mineral commodities, will be urged, by some of the witnesses who will appear before it, to recommend legislation which will make it possible for American consumers to pool their buying. In the case of tin it is believed by some of the non-ferrous specialists in the government service, who expect to be called before the committee, that this would constitute an important safeguard. Were the largest two American consumers—the U. S. Steel Corporation and the National Lead Co.—to have legal authority to join in their purchases of tin, it will be contended before the committee, they alone could do much to insure against price inflation.

It will not be contended that there has been any flagrant manipulation of tin by British interests, although it will be pointed out that they are in a position to bring about price advances if they should decide to do so—an ever present possibility with the success of rubber control before their eyes.

Though production of Brazilian tin is under American control, Nigerian tin, under British control, is necessary to its efficacious smelting. On the other hand, the Dutch are in a position, or soon will be, to smelt all of their own tin. A part of the Banka tin, now going to the Straits for smelting, is sent there so as to command the higher price obtainable for the Straits product. It will be pointed out, however, that the British long have refrained from resort to an export duty on tin metal (the export duty on tin ore is intended only to insure its smelting locally), when such a course probably would have rehabilitated the tin-plate industry at Swansea, which fell before American competition.

Some members of the committee favor the extension of testimony to include commodities not mentioned in the resolution. The thought is that the intent of the House is to have a clear understanding of the situation, and this may require some inquiry into other commodities.

Antimony is thought to present a slightly different phase of the problem. Producers of that commodity are understood to be anxious to increase their sales even at much lower prices than those now prevailing, but the amount of the material which is allowed to reach the market is being manipulated by middlemen, it is claimed.

Bill to Exempt Radium Claims From Assessment Work

Claims containing radium-bearing ores would be exempt from the requirements of annual assessment work for a period of three years from July 1, 1925, under the terms of a resolution which has been introduced in the House by Representative Brumm, of Pennsylvania. Any prospector, to obtain the benefits of the resolution, must file a declaration of intention in the location office before noon on July 1, 1926.

Appropriations for Alaska Roads

The Alaska Roads Commission has asked Congress for $1,700,000 to be used in road building during the next fiscal year. General Lord, of the Budget Committee, has cut this to $600,000, although $900,000 was appropriated last year. Former governor William Sulzer, having spent twenty years in Alaska, in a brief to the Budget Committee states:

"Barring the camps that are served by rail or water, I contend that at least one-third of all the minerals taken from the ground in Alaska has been consumed by the single item of excessive freight costs due directly to lack of good roads. In other words, good roads enabling the economical hauling of freight to and from the mines will make possible a saving equivalent to one-third of the value of the total output. To the uninitiated this statement may seem incredible, but not to the mining men who have been through the mill. For example, the White River mining district—a quartz and placer camp—has produced in excess of $500,000 in gold, and of this amount more than one-half has been expended in the hauling of supplies to and from the mines. Two hundred thousand dollars of this tremendous freight cost has been a loss due to the fact that there is no road to this district."

The transportation costs of one company in this district have exceeded $50,000, and of this amount more than $45,000 can be charged as a loss due to lack of roads. This loss is great, but in this instance some of the freight charges were on equipment, which charges do not recur annually. But the example shows the appalling handicap mining is laboring under in interior Alaska. Without freight conditions being improved by the construction of roads into mining districts, Alaska mining will be delayed indefinitely, but with good road construction cutting the operating costs, the mineral industry can be made to pay. Mr. Sulzer further says: "The Alaska Roads Commission, and Colonel James G. Steese, deserve support and commendation from the people of the United States. Individual states spend millions of dollars on a single road project, yet Alaska does not get sufficient help to enable her to progress intelligently in road building. Road administrative matters in Alaska are in capable hands."

Premier Gold Doubles Capacity

The Premier Gold Mining Co. is doubling the capacity of its mill, its water-power plant, and its auxiliary Diesel-engine plant. In this way it hopes to maintain its present high-rate of dividends, despite the markedly lower tenor of the ore in the deep workings. The company (British Columbia) has declared its usual quarterly dividend of $400,000, or at the rate of 32 per cent per annum, covering the last quarter of the year.

Empire Mines Extends Shaft to 2,350 Level

Deep work being carried on by the Empire Mines Company at Eureka, Utah, to develop fissures in the Chief Consolidated, the Eagle & Blue Bell, and the Ophir formations, is bringing some interesting results. Recently, a fissure leading to a main mineral channel was cut carrying 18 in. of ore with values as high as 60 oz. of silver, 12 per cent lead, 2 per cent copper, and $4.20 in gold.

A shaft is being sunk by the Empire Mines Company from the 1,800 level to prospect the Ophir formation, with which the Tintic Standard orebodies are associated. This will be the first work done in the older section of the camp in the Ophir horizon. A favorable faulting condition makes it possible to reach the Ophir formation at an estimated depth of 2,350 ft. No trouble with water is expected as there is ample equipment for pumping.

Big Missouri Mining Co. Organized

The Big Missouri Mining Co. has been organized at Tacoma and registered as an extra-provincial company in British Columbia, with an authorized capital of $5,000,000, to take over the Big Missouri mine, at the head of the Salmon River valley, from the Standard Mining Co., also of Tacoma, and to equip and operate it. Harry Townsend has been appointed consulting engineer for the company and P. E. Petersen, mine superintendent. The Standard company has had the mine under development for about a year, and some important new orebodies are said to have been developed. Besides the mining plant, the plans for the new equipment are said to include a mill and a tramway to tidewater.

North Butte and Tuolumne Copper Merge

Stockholders of the North Butte Mining Co. on Dec. 29 voted to merge the North Butte Mining Co. with the Tuolumne Copper Mining Co. at Butte, Mont. The capital stock will be increased from $9,000,000 to $10,000,000, and 1,000,000 shares of new stock, with a par value of $10 a share, instead of 600,000 shares of stock, with a par value of $15 a share, will be issued at an early date.

Condemnation Suit Filed Against Estate of E. A. Wall

The Utah Copper Co. has filed suit in the federal court against the estate of Colonel E. A. Wall to have several tracts of land in the West Mountain district, Utah, condemned and a price fixed. Utah Copper sets forth that it has attempted to buy the land to use for a dumping ground for the overburden that covers the ore of "copper mountain," but without success, and declares the land is essential to the economical conduct of its enterprise. The land in question is covered by old mining claims, and the Wall heirs have refused all purchase offers, preferring to hold the property.

Railroad to Crown King, Ariz., to Be Abandoned

The Santa Fe Railroad has applied to the Interstate Commerce Commission and the Arizona Corporation Commission for permission to abandon permanently the 13-mile railroad from the town of Middleton to Crown King camp. The line sought to be abandoned is part of the railroad between Prescott and Crown King, via Mayer and Middleton, terminating on the summit of the Crown King Mountains. It was built in 1898 by the late Frank Murphy. After the building of the railroad, the Murphy interests did some work at the mines, and at a later date, approximately 1915, the tailings dumps were treated by the Bradshaw Reduction Co. Since that time, except for assessment work and a small amount of development the camp has remained idle.

The railroad line is famous because of the number of switchbacks required to climb to the top of the mountain. In the 13 miles there are ten switchbacks and nineteen bridges across canyons. The grade on the 13 miles is 3½ per cent, and only five cars can be taken up or down at a time.

Ore-Hauling Teams Burned

A fire at Picher, Okla., on the night of Dec. 23, burned forty-two horses, belonging to George W. Moore, who has contracts for loading ore for shippers. Mr. Moore can account for the fire in no manner except that it was the deed of an incendiary, as the employees had all been away from the building several hours before the fire was discovered issuing from one corner of the barn by a passing motorist, who turned in the alarm.

Golden Rod and Commerce Lease Land Near Picher, Okla.

Renewed activity in that section of the Joplin-Miami mining district located just south of Hockerville, Okla., northeast of Picher, is assured in the coming months. The Golden Rod Mining & Smelting Co. has recently taken over considerable acreage there and has ten drill rigs operating. The Commerce Mining & Royalty Co. also has taken a lease in this section, and has started drilling.

Joplin Zinc Mines Prosperous

Good prices for ore have encouraged production in the Joplin field and all output records for other years have been broken in the production of both lead and zinc ores. Zinc-ore shipments for 1925 were approximately 800,000 tons, and those of lead ore close to 125,000 tons. Average production per mill was a little less than in 1924, the mills being operated on thinner ground in some cases, but the weekly output has been augmented by about 1,000 to 1,200 tons of flotation ore. Numerous companies which did not attempt it until recently are giving attention to this branch of concentration.

Federal Mining & Smelting is continuing its drilling under the option which it has on the Schwab land at Quapaw, Okla. The same company has about completed its mill on the property acquired from the American Zinc, Lead & Smelting Co. at Granby, Mo. The Grasselli Chemical Co., through its subsidiary, the Grasselli Mining Co., is conducting extensive developments on the Mexico-Joplin land a few miles north of Joplin. This company has put down 350 holes on 520 acres, and is now beginning the construction of a mill. Matthiessen & Hegeler are constructing a mill at the old Napoleon mine, north of Joplin. These two smelting companies, with the Kansas Exploration Co., have most of the acreage north and west of Joplin in Missouri under lease and are doing much drilling. Neck City camp, an old development northeast of Joplin, is also receiving their attention.

Anna Beaver Mining Co. is drilling on a section about three miles from the producing area of Picher-Cardin Camp, Okla., but as yet no definite results have been obtained. The Underwriters Land Co. is building a mill north of the Lucky Jew mine, in the northwestern part of the Kansas section of the Tri-State district.

Tri-States Zinc Shipments in 1925

Federal Mining & Smelting Co. was the big shipper of zinc concentrates in the Joplin-Miami district during 1925. It shipped 70,597 tons, which was approximately 10,000 tons more than in 1923, when it also was the leading shipper. Eagle-Picher Lead Co. was second in 1925, with 62,937 tons, or 20,000 tons more than in 1924. Commerce Mining & Royalty Co. was third, with 57,493 tons. Other leading companies, with tonnage shipped, were as follows:

Golden Rod Mining & Smelting, 43,000; Skelton Lead & Zinc, 29,242; Underwriters Land Co., 26,136; Vinegar Hill Zinc, 23,760; Anna Beaver, 19,956; Barnsdall Zinc, 18,735; St. Louis Smelting & Refining, 18,382; Butte-Kansas, 17,071; Cortez-King Brand, 16,152; Kansas Exploration, 16,037; Rialto, 15,798; Velie-Lion, 14,660; Admiralty Zinc, 14,633; Consolidated Lead & Zinc, 14,304; New Chicago, 13,576; Childress, 13,335; Quapaw, 13,304; Dorothy Bill, 11,165; and Huttig, 10,239.

San Juan, Colo., Again Active

There is renewed interest in the San Juan in Colorado, which will result in considerable activity soon. Several sound projects are under consideration. The new market for lead-zinc ores at Salt Lake City is beginning to bring out shipments of this kind of ore.

The Bachelor Consolidated Mines Co., of which George H. Beebe is manager, has reached the Bachelor and Pony Express veins with the new crosscut. This has disclosed good ore several hundred feet deep in the "Red Beds," which are the deepest undisturbed sedimentaries and have always been considered practically barren.

J. W. Slick and associates have just completed building a trail to the Sutton mine and the erection of a mining plant. The Barber crosscut has been started with air drills, and is expected to cut the Sutton vein in about a thousand feet. A good lead-zinc vein has been cut near the portal.

Three Months' Extension Given For Assessment Work

The Ontario Government has extended by three months the time for doing the first year's assessment work in the Red Lake district; otherwise many of the prospectors would have been obliged to take in equipment and supplies during the winter and begin work before the snow is gone.

Stripping and trenching on the property of the Howie Syndicate has met with favorable results, but much depends on the winter work as regards the policy to be pursued.

Motor sleds, which have been used successfully for transportation purposes over rough winter roads on the Pacific Coast, are to be employed in forwarding men and equipment to the Red Lake camp, in the Patricia district of Ontario.

Recent Developments in Alaska

A new strike is reported from Baranof Island, Alaska, where an orebody 6 ft. wide carries palladium, nickel, and copper. A location has been made on Chichagof Island on a vein 3 ft. in width, carrying palladium, gold, and silver. The Hirst Chichagof Mining Co. at Juneau, produced ore to the value of about $200,000 during the last year. A new strike was made at a point 2,000 ft. from the portal of No. 3 tunnel, where an oreshoot was found carrying average values of $75 over a width of 4 ft.

The Chichagof Development Co. is endeavoring to raise fresh capital to mine the ore left in the old Chichagof mine. It is estimated that there remains in the mine 40,000 tons of broken ore of an average value of $12 per ton, and 50,000 tons of $10 ore, for it was not considered profitable to extract anything running under $15 per ton.

A new quartz development is the Adanac, on the International Boundary, above Hyder. The Cantu, at the foot of Salmon Glacier, has shipped twenty tons of ore sorted from float and broken off the outcrops. Sampling shows values of about $150 a ton in gold, silver, and lead.

From Innoko the Flume Dredging Co. reports having experienced the best season on Yankee and Little Creeks since starting operations. Rich pay was found during the last season on Cripple Creek. A new hydraulic plant has been operating on Colorado Creek. The Anchorage Chamber of Commerce plans the erection of a sampling mill to assist prospectors in obtaining mill tests on their quartz locations.

A. N. C. Treadgold, formerly active in dredging operations in the Yukon, has taken up some claims on Coal Creek, near Circle City, where he plans mining by electric shovel, handling 4,000 cu.yd. per day.

The Katmai Gold Mining Co. has taken over the old Amook quartz mine, at Uyak Bay, Kodiak Island. New York capital is interested.

The Goldsmith Dredging Co. is being organized in Spokane by interests associated with the Silversmith and Leadsmith mining companies. Twenty-one claims have been acquired on Solomon River, 30 miles from Nome.

Copper Giant Elects Officers and Wins Trespass Suit

The annual meeting of the stockholders of the Copper Giant Mining Co., whose mining property is near Clark's Fork, Bonner County, Idaho, was held at the office of the company, at the mine, on Dec. 7, 1925, when the following officers and directors were elected to serve for the ensuing year: W. W. Von Cannon, president, Sandpoint, Idaho; Dr. J. D. Guy, vice-president, Sandpoint, Idaho; H. F. Thibadeau, secretary-treasurer and manager, Clark's Fork, Idaho. Directors are: Arthur E. Hunt, Walla Walla, Wash.; O. C. Thibadeau, Clark's Fork, Idaho; and the three first-named officers.

In the recent litigation between the Copper Giant Mining Co. and the Clarinda Mining Co. relative to trespass by Clarinda tunnel No. 5, and the diversion of water from a creek on the Copper Giant ground, the Court granted a permanent injunction against further trespass by the Clarinda company, and ordered that the Clarinda tunnel No. 5 be permanently sealed at the line of trespass, by building a concrete bulkhead three feet thick extending one foot into each side and the same distance into the top and the bottom of the tunnel. Also the defendant was ordered to seal, in the same manner, the mouth of two crosscuts on Copper Giant ground in tunnel No. 5. This work is to be done by and at the expense of the Clarinda Mining Co., according to the specifications, directions, and supervision of the engineer of the Copper Giant company. As a result of the decision it is expected that the creek water will eventually be returned to its original channel.

Activities in Black Hills District, South Dakota, in 1925

The Homestake Mining Co., Lead, S. D., was active during all of 1925. Production was on par with that of the last few years, and the output of gold and silver approximated $6,300,000. This is from 1,600,000 tons of ore. The company is continuing exploratory work, and at present diamond drilling is being done at the King of the West property, below Rochford. The Homestake has a two years' option on this and adjoining properties.

Cutting Mining Co., operating near Central City, continued active until October, when work was suspended. The flotation plant was in operation for some months, and several cars of concentrates were shipped. After milling was suspended in July the mine development continued, and two cars of gold ore were shipped to the smelter. The mine is opened to a depth of 500 ft., and most of the ore in the last shipments was taken from this lower depth.

Successful Tests Made on "Blue Ore"

Extensive experiments were completed, during the year, by the U. S. Bureau of Mines at the Reno station, on the "blue ores" of the northern Hills. The results obtained on this ore were very satisfactory, and further to determine the success of the new process, an experimental plant is being installed at the state School of Mines at Rapid City, and will duplicate actual milling practice. Experiments will be conducted over a period of six months or longer, and material from properties having "Blue Ores" will be used. The work is being financed by the mining interests of the Black Hills and the state school, and will be in charge of men from the Federal Bureau of Mines. There are deposits of these ores in the Bald Mountain and Maitland districts that could not be successfully worked, for the reason that the values could not be recovered by cyanidation. Under the process devised by the government a good extraction was obtained.

In the Southern Hills, the Maywood Chemical Co. continued the shipment of spodumene throughout 1925, and twenty-seven cars, which is the average per year, was sent to the plant in New Jersey. The Keystone Feldspar Co. made regular shipments of feldspar and also shipped several cars of mica. Keystone Arsenic Co. took over the Columbia, and is making preparations to start work on this gold property. Isabella Mining Co. installed machinery and began the development of a tin property near Spokane. The Spokane Lead Co. is also placing the property in condition for resumption of work. Dakota Mica Co. and Dakota Feldspar Co., near Pringle, made shipments of mica and feldspar. Climax Mica Co. developed its property near Custer and the Black Hills Mining Co. shipped andalusite from its property near Oreville.

Income Tax in British Columbia Reduced to 8 Per Cent

THE Government of British Columbia is showing a desire to lighten the burden of taxation and has recently put into effect a reduction in rate, which will be 8 per cent, instead of 10 per cent, on the net income in excess of $20,000. In addition an allowance has been made permitting companies to charge interest at the rate of 4 per cent on capital borrowed from outside the province. This reduction is of particular interest to the mining companies, which are taxed on the same basis as for industries, as it has been felt that taxation of mines in British Columbia has been on too high a basis.

Silver Age Mine Ships First Car of Ore

Ore is being taken from two headings in the Silver Age property, situated in Robinson Canyon, three miles from Ely, Nev. The first carload of ore, a silver-lead product, reached the Salt Lake market during the last week of November. The management plans to ship a carload each week. By the first of the year, it is believed that output can be increased to two carloads weekly. Besides stoping ore in two places, the company is pushing the main tunnel on to expose the ore beds on their dip.

Ontario Mines Pay $200,000,000 Dividends to Close of 1925

Irrespective of general trade conditions in other industries, shareholders in northern Ontario mines were extremely fortunate during 1925. The total amount distributed in dividends by the gold and silver mines to the end of 1925 was $151,000,000, which, adding the amount distributed by the nickel mines, would bring the aggregate well over the $200,000,000 mark. Of this remarkable total the silver mines have paid $100,000,000, the Porcupine mines $47,000,000, and Kirkland Lake mines $3,500,000.

During 1925, the silver mines distributed $2,094,000. This figure is somewhat larger than during 1924 on account of the entry of the Mining Corporation into the ranks of the dividend payers, as well as two distributions by Lorrain Trout Lake and the redemption of preferred shares by the Castle-Trethewey. The Porcupine mines paid $7,084,000, an increase of $1,205,000, while Kirkland mines paid $1,150,000 an increase $464,000. This brings the total for the year to $10,328,000, which is the largest amount distributed by the precious metal mines in a year, in their history. In addition to the amounts distributed in the form of dividends there has been an appreciation in values running into many millions of dollars; practically all of the stocks of the substantial gold and silver mines have shown large appreciations, and this applies as well to the nickel mines.

The most spectacular advances however have taken place in the new Quebec field. Noranda shares, which a year ago were selling for practically $100 a share, are now quoted at $1,300, and Horne Syndicate units, which cost the owners $20 each, recently changed hands at $10,500. The Horne Syndicate put up the money to finance the prospectors to stake the Horne property now owned by the Noranda. The property was sold for $320,000, of which $280,000 remains to be paid, and a 10 per cent interest in the Horne property. A new company will be formed on the Horne, in which the unit holders will get their proportion, and figures as high as $20,000 a unit are talked of. The good things coming to these shareholders do not appear to be over, as 1926 should show new production records in the gold mines, with new dividend payers coming in and larger dividends to be paid by some of the companies.

Conditions in the silver fields, particularly Gowganda and South Lorrain, are also very encouraging. The present dividend payers may be expected to maintain their disbursements, and there is every possibility of increases by some of them.

Aliens Barred From Siberian Gold Fields

The Soviet Government of Russia has barred all non-Russians from territory in Yakutsk Province, Eastern Siberia, in which extensive gold fields recently were discovered, in order to preserve the gold deposit for Russians only.

Toronto Letter

By Our Special Correspondent for Northern Ontario

Gold-Bearing Red Lake District Attracts Many Prospectors

A number of prospectors are leaving for the new Red Lake district in Patricia, where important gold finds were made last year. This is one of the most arduous journeys which Ontario prospectors have yet had to make, as traveling approximately 300 miles is required for the round trip, all of which must be done with dog team or on snowshoe. Most of these prospectors appear to be financed by syndicates which are anxious to acquire ground in a section where such rich ore has been reported.

Little news is yet available from the district, or from the work being done on the Hammell properties, but this condition will be changed within a few weeks, as both the Hammell syndicate and the McIntyre are sending in a new type of snow motor. This motor, instead of having wheels or the ordinary type of caterpillar traction, is equipped with round cylinders to which is fitted angle iron put on in spiral form, and their operation will be watched with great interest, because, if successful, they will solve winter transportation problems for other places remote from the railways.

Under ordinary circumstances the assessment work on the claims staked last fall would have to be completed by about June 1, and if this were done it would involve a lot of waste efforts, as men would have to be sent in now and would have to start work before the snow had left the ground. On account of this and the distance from the railway, the government is granting a three months' extension on all assessment work which has to be performed this year. To facilitate recording claims and work, the government will also open up a branch recording office at Sioux Lookout.

Nipissing Developing Mine in Quebec

The Nipissing mine, of Cobalt, has cut a vein on the 275-ft. level of the South Lorrain property which it has under option. This is the same vein which was found on the 200-ft. level. The extension is both stronger and better, although silver values are low. The company's most important development however, outside of work in Cobalt, appears to be in Quebec, where a large acreage in Montbray Township is under option. Preliminary assays gave copper 4 to 6 per cent and gold $3 to $5.50. The Nipissing South Lorrain property adjoins the Canadian Lorrain, where the raise on No. 17 vein from the fourth level is now up 70 ft., with several inches of high-grade ore showing in the back. There is in addition three to four feet of mill ore of good grade, and the find is one of the most important silver discoveries made in northern Ontario for some time. Canadian Lorrain will ship a car of high-grade ore sometime during January.

The Hylands property, in Gowganda, is now being opened up. There is a shaft 50 ft. deep on the property, and a plant is to be installed, which will permit further operation.

In the Elk Lake region, encouraging results have been obtained on the Beaver Auxiliary, which is controlled by the Beaver Mines, of Cobalt. It has been decided to continue the shaft below the 300 ft. level, where veins carrying some silver values have been found.

Freight on Explosives Reduced

Recently the Board of Railway Commissioners issued a general order directing that the freight rate on high explosives be reduced from the special classification to the first-class mileage rates. This order applied to carload lots only. The railway companies appealed against the ruling of the board, asking for a re-hearing, but the board has now issued a final order that the application for re-hearing be refused, and that the new tariff on explosives shall go into effect not later than Jan. 8, 1926. This means a reduction of approximately 25c. per 100 lb. for northern Ontario mines north of North Bay, and approximately 36c. per 100 lb. for powder to the Sudbury district. Taken in conjunction with the recent reduction in the price of explosives, it represents a substantial saving to the operators. At the present time dynamite is selling within 15 per cent of its pre-war price.

Asbestos Mines, Ltd., Declared Insolvent by Court

Asbestos Mines, Ltd., one of the companies the properties of which it is proposed to include in the asbestos merger, has been declared insolvent and the court has ordered that its affairs be liquidated. A petition alleging that the company could not meet its debts and that the directors had decided to wind up the business was presented in the Supreme Court at Montreal. The granting of an order of liquidation was opposed by Samuel W. Cohen and the General Asbestos Co., on the ground that they were interested in the proceedings and had a right to intervene. They alleged that the placing of the company in liquidation was a manoeuver to make the stock of the company valueless, so that it could easily be acquired by the proposed merger. On Dec. 31, chief justice Martin of the Supreme Court gave judgment dismissing the intervention of Cohen and ordering the affairs of the company to be wound up and a meeting of creditors, shareholders, and contributaries of the company to be held at Montreal on Jan. 14, with costs against Cohen. Messrs. Twicotte and Merrill were appointed provisional liquidators.

Johannesburg Letter

By John Watson

Special Correspondent

Transvaal Mineral Production in Ten Months £45,308,785

Torbanite Discovered Yielding 36 Gallons of Oil per Ton—Green Diamonds Found

Johannesburg, Dec. 1—The Department of Mines has just issued production statistics up to the end of October, shown in accompany table.

A discovery of torbanite is reported from the district of Greylingstad, in the Transvaal, where the owner, Horn, has put down two boreholes on the farm Herbstfontein. Samples sent for distillation tests gave from 36 to 48 gal. of crude oil per ton of torbanite.

On the commonage ground at Klerksdorp, in a test wash of about one hundred loads of decomposed banket, a prospector named W. Wilson recovered twenty green diamonds, totaling thirteen carats, varying in size from one-half to two carats each. The value of these stones will depend on cutting tests, which are being carried out. In addition to the diamonds, it is claimed that the same reef will yield 3 or 4 dwt. of gold per ton. Most of the available ground there has recently been pegged.

Transvaal Mineral Production, January-October, 1925

	Monthly Output, 1925		Ten Months Totals	
	October	September	1925	1924
Gold (standard price)	£3,463,609	£3,406,930	£34,089,331	£33,779,278
Silver	15,079	13,435	144,952	176,908
Osmiridium	16,280	35,649	143,814	68,509
Diamonds	767,312	734,275	6,805,277	6,812,346
Coal	313,609	328,472	3,235,736	3,192,074
Copper	44,993	38,118	438,133	431,159
Tin	21,999	11,644	219,920	254,934
Other Minerals	21,974	22,736	231,622	245,641
Totals	£4,664,855	£4,591,259	£45,308,785	£44,959,849

On the Johannesburg Stock Exchange, during the last week, gold shares have sagged in price, chiefly owing to the shortage of native labor on the mines. Platinum shares have, on the whole, been lower: Potgietersrust platinums were, however, in strong demand for a time, and rose from 9s. to 11s. 6d. per 5s. share, then closed the week on Saturday at 10s. 7d. T. C. Lands have gained about 2s. during the week rising from 57s. 6d. to 59s. 6d.

Chalk Mountain Silver-Lead Mine Leased

The United States S. R. & M. Co. has leased part of the ground of the Chalk Mountain Silver-Lead mine, at Chalk Mountain, near Fallon, Nev. The ground leased is about 800 ft. north of the working shaft of the mining company in undeveloped territory, but on the strike of the big fissure in which ore is found. Machinery is to arrive in Fallon at an early date to operate the lease.

Options have been taken on two Nevada properties by the same company. One is the Mount Hope property, on Garden Pass summit, 25 miles north of Eureka.

London Letter

By W. A. Doman
Special Correspondent

Rhodesian Congo Concessions Develops Copper Deposit

London, Dec. 22.—An interesting report has been issued by the directors of the Rhodesian Congo Border Concessions. It is written by P. K. Horner, consulting engineer, following his recent visit to the property. Seventeen new discoveries were made, but most attention was devoted to the N'Changa area. Mr. Horner is satisfied that, apart from the main lode, an important mineralized bed has been proved. In the Dambo an inclined depth of over 1,000 ft. has already been shown by the drill holes, a strike or width of nearly 2,000 ft. is indicated, with a thickness of 100 ft., and values from 2.5 per cent to 5 per cent copper. The deepest hole shows 5.2 per cent over 75 ft. In this N'Changa district there is what appears to be a basin deposit of ore 4,000 ft. by 5,000 ft. in extent, with the N'Changa mine occupying a place on one edge of it and the Dambo and the New Discovery on other edges, which are being explored. Electric prospecting has proved most effective, making possible the accurate mapping of ore deposits which do not come to the surface, and three additional occurrences have been located. These have been tested by drill holes with most satisfactory results. It is stated that the treatment of this ore presents no difficulty. Standard Minerals Separation flotation methods, followed by reverberatory smelting and converting, give a very high recovery. It is a primary copper sulphide, very much richer but in other respects precisely similar to the ores worked by the American porphyry mining companies. In the southern area of the company's concession the Chifumpa already shows 175,000 tons of 7.6 per cent ore above the 150-ft. level.

An Anglo-American syndicate, in which are mining engineers and financiers, has acquired a working option on a property in the Muri province of Northern Nigeria, on which the outcrop of a silver-lead deposit is reported to have been traced for two miles. This is regarded as of great importance, and next month Frank B. Powell, who has spent much time in examining properties in Nigeria, is going out to investigate. An idea of the importance attached to the find may be gathered from the fact that A. Chester Beatty, of the Selection Trust, is associated in it with W. S. Robinson, of the Broken Hill mines, in Australia; the Burma Corporation and the National Smelting Co., and C. L. Baillieu, of the Zinc Corporation.

At the meeting of Russo-Asiatic Consolidated Leslie Urquhart was not able to make a very encouraging report as regards the Russian properties. Negotiations have dragged on, but nothing satisfying has resulted. It appears that the Soviet authorities worked various of the mines while the stores lasted and the funds of the company were available. As soon as these were exhausted, operations came to a standstill, and the plant was allowed to get out of condition. The important point about any new concession, and one emphasized by Mr. Urquhart, is that the holder is compelled by one of the terms to produce so much metal within a certain period; otherwise the concession becomes forfeited. It is absolutely impossible to guarantee such production, and any new capital subscribed is therefore in the circumstances likely to be lost.

Dr. J. Coggin Brown, of the India Geological Survey, is proceeding to the Southern Shan States to undertake an investigation.

Oil Prospecting in Switzerland With Rotary Drill

Considerable interest is being manifested in Switzerland in the oil prospecting that is now being carried on in the vicinity of Tuggen, the Canton of Schwyz. A twenty-five meter derrick has been erected, and about twenty men are working day and night, in three shifts. The boring operations are carried on by means of steel pipes screwed one to another, each of a length of nine meters. Thus far fifty-five of those pipes have been driven into the ground. The bore hole has a depth of about 500 meters. To what depth the drilling will be carried on has not as yet been decided, but it is thought that a depth of about 1,000 meters will be the maximum.

Soviet Russia Grants Mining Concession to German Firm

The German firm of Hugo Stolzenberg & N. Jakowlew has been granted, by the Russian Soviet government, a concession for the exploitation of gold deposits in the Government of Tomsk, Siberia. The contract runs, according to Moscow authorities, for a period of twelve years, with another period of twelve years if the owners of the concession guarantee, at the end of the first period, an output of at least 10 Russian poods per year. The present exploitation program provides for an output of 5 poods (160 kg.) for the first five years and of 8 poods per year for the next seven years. Of the total production the Soviet government is to receive 3 per cent.

Bold Attempt to Swindle California Investors

One of the boldest attempts to swindle California investors so far discovered came to the attention of the State Corporation Department when a representative of a big oil-refining company informed Commissioner Edwin M. Daugherty that persons representing themselves as agents for the company were calling upon its stockholders, demanding their stock, and representing that the stock was to be exchanged for other securities of the company. Investigation developed that a list of the company's stockholders had been secured by outsiders from a woman connected with a mimeographing concern. This woman is said to have received one cent for each name on the list of stockholders.

Melbourne Letter

By Peter G. Tait
Special Correspondent

New General Manager for Burma Corporation, Ltd.

Melbourne, Dec. 8—E. Hogan Taylor has been appointed general manager of the Burma Corporation, Ltd. He left Melbourne by mail steamer on Nov. 24, and is due to meet W. S. Robinson at Colombo. Mr. Taylor succeeds P. E. Marmion, who, like Mr. Taylor, was a Western Australian manager at the zenith of the gold fields. After leaving Western Australia Mr. Taylor was for three years manager of a gold mine in Lumatia. Leaving there he returned to London, and in April, 1914, came back to Australia as general manager of the Great Cobar, Ltd. Since then he has been in private practice. Mr. Marmion has been appointed a director of the company.

Sir Edgeworth David, who is en route to London, interviewed at Perth, W. A., stated that all the evidence showed that there must still be a large amount of unexploited alluvial gold, not to mention reef gold, in Western Australia. This state had produced since 1886 about 35,000,000 oz. of gold, worth about £135,000,000, of which less than £1,000,000 worth had been obtained from alluvial deposits. The deep leads in the eastern states and many other parts of the world had yielded such vast quantities of gold that there could be no doubt that a far greater quantity of gold than 35,000,000 oz. was still contained in as yet unproved alluvial deposits or ancient channels, which would be ultimately proved and exploited by the enterprise of scientifically directed mining engineering, and economic business administration.

Guanajuato Mother-Lode Company Promotion Questionable

Following the receipt by California physicians of circular letters and other literature extolling the possibilities of the wealth of properties of the Guanajuato Mother-Lode Silver-Gold Corporation, California, Edwin M. Daugherty, Commissioner of Corporations, made known that the company has no permit to sell its securities in California. Literature received through the mails indicates that the company has property in Mexico. The offer, according to Mr. Daugherty, is not for those satisfied with the usual returns from public utility or municipal securities, but for speculators who want to realize $10 000 or more from an investment of $1,000.

"Because the offers are made by mail and the company has headquarters in New York and Mexico City," Commissioner Daugherty said, "we find it impossible for the state to take jurisdiction over its activities. The literature contains representations that prelates and high church dignitaries are connected with the company, but an investigation by the department shows the church has nothing to do with the company."

Societies, Addresses, and Reports

Engineering Council Musters Forces for Interior Department Reorganization

Will Back Jones-Wyant Bill—Meets at Washington on Jan. 13 to Hear Reports—Secretary Work Favors Project—Plans for Co-operation

COMMITTEES of engineers, with a total membership of nearly 1,000, are being organized in every state by the American Engineering Council to carry on a nation-wide movement for the reorganization of the Department of the Interior, according to an announcement by the president of the Council, former Governor James Hartness of Vermont.

The engineers ask that the name of the department be changed to the Department of Public Works and Domain. They recommend drastic changes in the distribution of federal administrative functions "so that the enormous public-works activities of the government, involving the expenditure of many millions annually, may be effectively co-ordinated, efficiency promoted, and waste wiped out."

The Engineering Council is embodying its proposal in the Jones-Wyant bill to be introduced in Congress in the near future.

Edward Mead, U. S. Commissioner of Reclamation, is quoted in the Council's announcement as saying, "I hope the bill will pass." Secretary Work, it was said, also favors the plan of the Council, to which he has written, "I believe with Commissioner Mead that this is a good bill."

Under the reorganization scheme advocated by the engineers, the Bureau of Public Roads, now in the Department of Agriculture, and the office of the Supervising Architect, now in the Treasury Department, could be transferred to the new Department of Public Works and Domain.

The Rivers and Harbors Improvements, Mississippi River Commission, and California Debris Commission, at present under the jurisdiction of the War Department, would go to the new department, together with the office of Buildings and Grounds, District of Columbia; the Superintendent of the State, War, and Navy Department buildings, the Rock Creek and Potomac Parkway Commission, and the office of the Architect of the Capitol. The Board of Road Commissioners for Alaska would be abolished and its duties performed by the Secretary of Public Works and Domain.

One interesting feature of the bill is a provision that the engineering officers of the U. S. Army may be detailed by the Secretary of War to non-military duties having to do with river and harbor improvements, the Mississippi River Commission, the California Debris Commission, or other civil functions with the approval of the Secretary of Public Works and Domain.

The state committees of engineers will work in co-operation with a National Public Works Committee of the American Engineering Council and with the Public Works Advisory Council, established in 1924 and composed of representatives from engineering and allied organizations.

The engineers, the announcement states, hope to effect a complete reshaping of the Department of the Interior during 1926. The present effort, it was explained, is a continuation of the work of the National Public Works Department Association begun in 1919.

The engineers feel that this phase of Federal Government reorganization cannot longer be delayed. The existing structure of the Department of the Interior is denounced as archaic, its very name suggesting conditions prevailing a century ago, when "Interior" applied to the region beyond the Alleghanies.

Millions can be saved yearly and a vast improvement in method accomplished by wiping out wasteful practices, involving costly and unwise duplication, it is contended. The department as it now exists is called an unnecessary burden on the taxpayers, and its remodeling a pressing national need.

The public-works plan will be publicly discussed at the annual meeting of the American Engineering Council to be held in Washington, D. C., for three days beginning Jan. 13. The Council's Committee on Government Reorganization, of which Gardner S. Williams, of Ann Arbor, Mich., is chairman, will present a report to representatives of thirty national and local engineering societies.

A.S.&R. Official in Colorado Sees Revival of Mining

R. F. McElvenny, manager in Colorado for the American Smelting & Refining Co., in an address before the Engineers' Club of Denver predicts a revival of mining in Colorado.

"The low ebb to which mining in Colorado had sunk a year ago," McElvenny said, "is shown in the fact that there was only one smelter left in the state whose continuance was not questioned. The only other smelter was at Leadville, and there was serious talk of discontinuing it. Twenty-two years ago Colorado had not fewer than eight active smelters, all doing good business —three in Denver, two at Pueblo and one each at Durango, Salida and Leadville. There were also many small ore-treatment plants of various descriptions. This year the revival came, thanks to the new ore-treatment processes, and next year will see much larger things in the mining world of this state.

"Leadville in particular has shown great revival, and there will soon be a 300-ton daily capacity mill opened there for the treatment of lead-zinc ores by the selective flotation process.

"That character of mill is the solution of the mining problem in Colorado. There no doubt are vast quantities of ores already in sight that have been left for many years untouched because the old smelting system could not handle the product. Today the solution is seen in the comparatively small mill capable of treating the lead-zinc ores and reducing them to concentrates that can be shipped to the large plants for final refining. Such plants are going up at Rico, Lake City, Aspen, and several other places.

"What this will mean to Colorado mining will be demonstrated within the next twelve months, when new millions of revenue to the state will be brought into circulation from the heretofore useless lead-zinc ores."

Meetings of New York Sections of Engineering Societies

Below is list of the forthcoming meetings so far as scheduled, of the New York or Metropolitan sections of the four National engineering societies. Members of all four societies will be welcome at all meetings and are cordially invited to attend and take part in the discussions. All meetings will be held in the Engineering Societies Building, 29 West 39th St., at 8:15 p.m. except the two of the A.S.M.E. as noted and those of the A.I.M.E., which will be held at the Harvard Club, 27 West 44th St., New York, and at the Machinery Club, 50 Church St., alternately, as noted at 8 p.m.

Date		Subject	Society
Jan.	13	Meeting of student branches	A.S.M.E.
Jan.	14	"Welded Pressure Vessels"	A.S.M.E.
Jan.	18	"Domestic Heating"	A.S.M.E.
Jan.	19	Subject to be announced (Machinery Club)	A.I.M.E.
Jan.	27	"Industrial and Economic Recovery of France"	A.S.M.E.
Jan.	29	"Trend of Electric Light and Power Industry"	A.I.E.E.
Feb.	4	"Development of Workers' Co-operation"	A.S.M.E.
Feb.	10	"Machine-Shop Practice" (Brooklyn)	A.S.M.E.
Feb.	18	"Diesel Electric Locomotives"	Joint meeting
Feb.	24	"Boiler Tube Corrosion"	A.S.M.E.
Feb.	24	"Distillation of Coal"	A.S.M.E.
Feb.	28	"Tidal-Power Development at Passamaquoddy Bay"	A.I.E.E.
March	3	"Buying and Replacing Machine Tools" (Newark)	A.S.M.E.
March	4	"Water Purification for Textile Processes"	A.S.M.E.
March	11	"Material Handling in Coal Mines"	A.S.M.E.
March	16	Subject to be announced (Harvard Club)	A.I.M.E.
March	17	"Regional and County Parks"	A.S.C.E.
March	17	Subject to be announced	A.S.M.E.
March	24	"Opportunities for Engineers in Industry"	A.S.M.E.
March	26	"Electric Signaling and Automatic Train Control"	A.I.E.E.
April	8	"Combustion Problems"	A.S.M.E.
April	14	"Qualifying Engineers for High Executive Positions"	Joint meeting
April	22	"Oil and Gas Engine Power"	A.S.M.E.
April	23	"Operating New York's Subways"	A.I.E.E.
May	18	Subject to be announced (Machinery Club)	A.I.M.E.
May	19	"Garbage Disposal"	A.S.C.E.

Men You Should Know About

Carl O. Lindberg, of Los Angeles, is in New York.

Morton Webber is in London and will sail soon for New York.

J. C. Pickering has left, on professional business, for Georgia, Russia. He will be there a number of months.

Leon Charlot, mine surveyor for the Engels Copper Mining Co., has resigned to accept a similar position at Bolanos, Mexico.

Samuel W. Cohen, consulting engineer, of Montreal, has gone to San Francisco, where he will be engaged for a month on professional business.

R. L. Chase, of Los Angeles, has left for Sinaloa, Mexico, to inspect his mining properties in that state. He will return to Los Angeles about the first of February.

Clifford R. Wilfley, of Ouray, Colo., has been appointed consulting engineer to the Ophir Bondholders' Committee, operating the Silver Bell mine at Ophir, Colo.

Horace Young, formerly manager of the Harker Gold Mines, has been appointed manager of the Castle-Trethewey mine, in Gowganda, to succeed **Murray Kennedy.**

C. F. Heathcote, formerly general manager of the Tasmania gold mine at Beaconsfield, Tasmania, and now in charge of mines in Mysore, India, is soon to revisit Australia.

T. S. Carnahan, assistant general manager of the Union Minière du Haut-Katanga, is visiting Egypt and Brussels on his return from Africa. He is expected to arrive in New York early in April.

Scott Turner, Director of the U. S. Bureau of Mines, was the guest of honor at a banquet given recently by Denver mining men on the occasion of Mr. Turner's visit last month to Colorado.

A. J. Eveland, who has been since last October examining mines in the district of Mina, Chihuahua, Mexico, will soon leave New York for the properties, which have been acquired by a newly organized company.

Arthur V. Corry, head of the firm of Harper, McDonald & Co., of Butte, Mont., has been appointed general manager of the Livingstone Mines Corporation, north of Mackay, Idaho. Mr. Corry will take charge on Jan. 10.

Dr. Robert J. Anderson, consulting metallurgical engineer, has just been appointed district manager of the F. J. Ryan & Co., Industrial Heating Engineers of Philadelphia, Pa. Dr. Anderson will represent the company in Cleveland and the Ohio district and surrounding territory.

Donald M. Liddell, president of the Crown Cork & Seal Co., of Baltimore, and chairman of the board of the Crown Cork Co., Ltd., of London, recently sailed for an inspection tour of the plants of the two companies in England, France, Spain, and Portugal. Mr. Liddell expects that this tour will require two months.

H. A. Wentworth and **H. C. Davis,** of Boston, members of the WAD Syndicate, have recently returned from England, and are now visiting the central Manitoba mines. This company is being financed by John Taylor & Sons of London, with whom Messrs. Wentworth and Davis were concluding arrangements for further financing.

George J. Young, associate editor of the *Mining Journal-Press,* will return to San Francisco Jan. 14, 1926, after completing the editorial work on the Annual Review Number. In addition to his present work on *Mining Journal-Press,* Mr. Young will devote part of his time to *Coal Age,* particularly serving the coal-mining districts of the Western states.

George J. Young

F. Dean Bradley, who has had charge of vocational education for the Nevada State Board of Education, has been granted a leave of absence until June 1 in order that he may assist the Arizona state department of vocational education with some specialized work in industrial education. The request from Arizona came as a result of the demands of the Arizona copper-mining companies for foremen conferences which require a trained leader. Mr. Bradley's place will be filled temporarily by **A. E. McArthur,** principal of the Virginia City school of mines.

T. M. Owen, metallurgical and mining engineer, of America, recently visted the Mount Isa silver-lead mines, in Queensland, Australia, on a commission from Mount Isa Mines, Ltd., to consult with W. H. Corbould, managing director, as to the best method of treatment for the ore from those mines. He reached Australia, after an absence from that country of twelve years, in June last. He went first to Broken Hill and afterward to Port Pirie, in South Australia, where Broken Hill ores are treated. After two investigations at Mount Isa, he was, in the middle of November, 1925, at Sydney designing a pilot unit for the ores of the Mount Isa Mines, Ltd. In America Mr. Owen was assistant general manager of the Federal Mining & Smelting Co. He intends returning to America early in 1926, but hopes to be back in Australia before the end of the following June. Mr. Owen has expressed his belief that in Queensland Mount Isa represents one of the largest known tonnages of silver lead ores.

Obituary

William Fentress Thompson, editor of the *Fairbanks News Miner,* died at Fairbanks, Alaska, on Jan. 4. He was sixty-two years old.

Stewart Macphail, who has been general manager of the Geduld mine, on the Far East Rand, since 1917, died on Nov. 28. For several years, prior to 1917 Mr. Macphail was underground manager on Geduld, under the late L. A. Womble. Mr. Macphail was born in Capetown and educated at the South African College. He was highly esteemed on the mine and throughout the district. He leaves a widow and two children.

Emmet Derby Boyle, mining engineer, and Governor of Nevada from 1915 to 1923, died on Jan. 3 after an illness of several weeks. He was publisher of *The Nevada State Journal* and general manager of the Mason Valley Mines Co. He was a native of Nevada. Before being elected Governor, on the Democratic ticket, he was State Tax Commissioner and State Engineer. Ex-Governor Boyle was born in Virginia City, Nev., in 1879, took his bachelor's degree in science from the State University in 1899, adding an E. M. four years later. He served as engineer with the British American Corporation in British Columbia, then as engineer and mine superintendent with the Compañia La Esperanza y Anexas, El Oro, Mexico. From 1901 to 1907 he was manager of the North Rapidan Mines Co. at Como, Nev., and since then had been a consulting expert, a member of the firm of Himdry & Boyle. He was president of the Reno Chamber of Commerce and a member of several scientific and Greek letter societies.

Professor William Otis Crosby, geologist, and long on the faculty of the Massachusetts Institute of Technology, died on Dec. 31, 1925, at Jamaica Plain, Mass. He was born in Decatur, Ohio, on Jan. 14, 1850, the son of Francis William and Hannah Everett (Ballard) Crosby, and was educated at the Technology, receiving his B. S. degree in 1876. He engaged in mining in North Carolina and Colorado, and in 1883 became a member of the faculty of the Technology, holding the chair of geology until 1907, retiring to become associated with the Carnegie Foundation. Professor Crosby was consulting geologist for the United States Reclamation Service. He was a fellow of the American Academy of Arts and Sciences, the Geological Society of America, the Seismological Society of America, the American Institute of Mining and Metallurgical Engineers, Economic Geologists, Boston Society of Natural History, Appalachian Mountain Club, and other societies. He was the author of many works on geology and mineralogy. In September, 1876, Professor Crosby married Alice Ballard, of Lansing, Mich. She survives him, with a son, Irving B. Crosby.

Recent Technical Publications

Reviews, Abstracts, and References

Canadian Mineral Resources — The Canadian National Railways has issued an interesting brochure containing maps and information concerning the mineral resources along its lines in northeastern Canada. Many rich mining districts are covered, and there is much more promising ground for prospectors. Copies are obtainable on request to the Superintendent of Development, Canadian National Railways, 1 Toronto St., Toronto, 2, Ont.

The "Geology and Mineral Deposits of the East Central Manitoba Mining District" are the subject of a 19-page paper in the *Bulletin* of the Canadian Institute of Mining and Metallurgy for December (Montreal; price $1). The author is J. F. Wright. In the same bulletin is an 11-page paper by R. C. Wallace on the "Mineral Deposits of Hudson Bay Territory."

Sulphur Mining—The December issue of *Chemical and Metallurgical Engineering* (New York; price 35c.) contains a short article by W. T. Lundy on the Frasch process of mining sulphur. The Freeport Sulphur Co. brings 4,000,000 gal. of water a day from a source 5 miles from Hoskins Mound, purifies it, heats it to 350 deg. F., and pumps it through pipe lines from 1,000 to 5,000 ft. long to the underground strata of sulphur-bearing material.

Bureau of Standards—The functions and activities of the U. S. Bureau of Standards are explained in a 113-page bulletin just issued. The work of the Bureau is varied and extensive and it is well described in this paper in nontechnical language. Requests should specify "Circular of the Bureau of Standards No. 1." It is obtainable from the Superintendent of Documents, Washington, D. C., for 50c.

Zeolites—"The Use of Zeolites To Soften Water by Filtration" is discussed in a three-page article by H. W. Terry in the Nov. 17 issue of *Power* (New York; 15c.). Glauconite, greensand, or Jersey marl, is used for this purpose, as well as a certain kind of clay mined and processed in South Dakota.

Lubrication—The September issue of *Lubrication*, published for free distribution by The Texas Co., New York City, contains a 12-page article of practical interest on the "Lubrication of Rock Products Machinery," and the issue of October has a similar article on "Electric Motors and Their Lubrication."

Microscopic Examination—*The General Electric Review* (Schenectady, N. Y.; 30c. per copy) has been publishing a series of three articles by Gustav Pirk on "The Technique of Examining Metals Under the Microscope." In the second article, which appeared in the November number, the best known etching reagents for metals and their alloys are given, and in the last article the author will discuss the optics of the microscope and efficient methods for recording the results of the examinations.

Diatomaceous Earth — Diatomaceous earth increases the strength and workability of concrete, according to tests carried out in North Carolina and discussed in a short article by C. N. Connor in *Engineering News-Record* of Dec. 17 (New York; 25c.). Specifications for diatomaceous earth to be used for this purpose are included.

Canadian Iron — Statistical data on "Iron and Steel and Their Products in Canada, 1923" have recently been issued by the Dominion Bureau of Statistics as an 84-page bulletin. A directory of the firms making manufactured products of iron and steel is appended. Copies are obtainable for 25c. from the Dominion Bureau of Statistics, Ottawa.

African Bauxite—"Bauxite Deposits in Nyasaland," by F. Dixey, is the subject of a 5-page article in the October issue of *The Mining Magazine* (London; 1s.). The deposit described is on the Mlanje Mountains and has only recently been discovered, so not much is known about it.

Bolivian Mineral Industry—*The Mining Journal* (London; 8d.) has recently published a series of articles compiled from an article in *Metall und Erz* on "The Mineral Resources of Andean Bolivia." Considerable operating data and costs are given. The article appeared in the issues of Oct. 3, 10, 17 and 24.

Value of Mining Stocks—Frank E. Lathe has an article of 3 pages in the Oct. 16 issue of *The Canadian Mining Journal* (Gardenvale, Que.; 15c.) "On the Value of Mining Stocks," of interest alike to mine managers and investors.

Zinc Retorts—B. M. O'Harra has compiled a bibliography on zinc retorts and condensers, listing 195 references covering the literature of the last half century. The bibliography is limited to references to the usual types of horizontal retort and the condensers that are used with them. This is Technical Bulletin No. 4 of the School of Mines and Metallurgy, Rollo, Mo., and may be obtained on request.

Transactions A. I. M. E.—Vol. 72 of the *Transactions* of the American Institute of Mining and Metallurgical Engineers is now available. It consists essentially of papers and discussions on mining and sampling. Obtainable from the Institute, 29 W. 39th St., New York.

South African Gold—Four bulletins containing "Evidence of the Gold Producers' Committee of the Transvaal Chamber of Mines" have been issued by the Economic and Wage Commission. These deal principally with wages. Copies are obtainable from the Transvaal Chamber of Mines, P. O. Box 1162, Johannesburg, South Africa.

South African Platinum—The Dec. 2, issue of *The Mining and Industrial Magazine of Southern Africa* (Johannesburg; price 6d.) is a special platinum number, and gives a great deal of information about the recently discovered platinum deposits of Transvaal. A sketch map of the district is inserted.

Patents

Electrolytic Copper—No. 1,566,265. Dec. 22, 1925. F. L. Antisell, Perth Amboy, N. J. A process of electrolyzing cupriferous solutions which comprises carrying out the electrolysis in cycles, the current being impressed during a certain fraction of each cycle.

No. 1,567,737. Dec. 29, 1925. M. A. Jullien, Paris, France. Apparatus for the electrolytic manufacture of copper sheets, comprising a container for the electrolyte, a revolving cathode, and an anode with permeable walls.

Tin Reduction—No. 1,566,352. Dec. 22, 1925. J. R. Stack, Perth Amboy, N. J., assignor to American Smelting & Refining Co., New York. Tin-containing material is crushed, heated in a closed receptacle to a temperature above the reducing point of tin and below the reducing point of iron, and subjected to the action of a gas that will reduce the tin oxides. The liberated tin is removed and the residue treated to recover contained metals.

Sulphide Ore Treatment—No. 1,566,379. Dec. 22, 1925. M. De Keyser, Oakland, Calif. Sulphide ores and concentrates are roasted to produce sulphur dioxide, into which ozone is introduced and the mixture passed through a catalyzing agent.

No. 1,567,378. Dec. 1925. W. S. Millar, London, England. A process of concentrating and desulphurizing sulphide iron ores, comprising the treatment of the crushed ore by sulphur dioxide in a muffle furnace, the gas containing at least 50 per cent SO_2 and the ore being continuously agitated and progressively heated to a temperature not exceeding 950 deg., in such a manner that no fusion occurs.

Rock Drilling—No. 1,566,499. Dec. 22, 1925. J. S. Mitchell, Chicago, assignor to Sullivan Machinery Co. A method of determining the inclination of strata being drilled.

No. 1,566,630. Dec. 22, 1925. T. E. Sturtevant, Dover, N. J., assignor to McKiernan-Terry Drill Co., Dover, N. J. Device for holding steel in a rock drill.

No. 1,567,504. Dec. 29, 1925. Grant Hinman, Clarkdale, Ariz. Design of a drill puller.

Electrolytic Amalgamator — No. 1,566,755. Dec. 22, 1925. C. A. McCourt, Oakland, Calif. Apparatus for recovering the lighter mineral particles from slime by treatment with an amalgamating solution which is charged by an electrolytic cell.

Flotation—No. 1,567,501. Dec. 29, 1925. John Herman, Los Angeles. Flotation machine in which the air is introduced through a rotating perforated pipe, placed horizontally in the bottom of the cell.

Concentrating Tables—Nos. 1,567,548-53. Dec. 29, 1925. A. H. Stebbins, Los Angeles. These six patents cover designs for the beds, supports, and operating gear for concentrating tables.

Molybdenum—The International Molybdenum Co., Porthill, Idaho, calls attention to a change in the composition of the molybdenum separating solution, published on page 911 of the Dec. 5, 1925, issue. Kerosene is used in the compound instead of paraffin, as stated. The company named has bought the patent.

McGraw-Hill Company Buys Keystone Catalogs

Also Acquires Mining and Quarrying Directories and List Services—
Joseph J. Vigneau and Ralph C. Becker Continue in Charge

THE McGraw-Hill Co., Inc., has bought the Keystone Consolidated Publishing Co., of Pittsburgh, Pa., and thereby acquires the two Keystone Mining Catalogs, the Coal Catalog, the mining and quarrying directories, and the list services published and conducted by the Keystone company. There is thus brought into one organization the outstanding publishing interests serving the mining field—the McGraw-Hill Co., with its magazines, *Engineering and Mining Journal-Press* and *Coal Age*, and the Keystone company, with its catalogs, directories, and lists. *Engineering and Mining Journal-Press* and *Coal Age* have served the mining industries for more than two generations, and the purchase of the Keystone property will enable them to broaden and intensify that service and assist, even more than in the past, in the solution of the problems of these industries. At the same time, there is offered to the manufacturers who make the machinery, tools, and supplies with which the industry does its work a coordinated advertising service, consisting of educational and creative advertising in the magazines, efficient catalog distribution through the Keystone catalogs, and direct-by-mail effort through the list service.

Keystone Catalogs, published annually, are condensed and consolidated catalogs of manufacturers selling to the mining and quarrying fields, and give in convenient form the essential facts regarding the machinery and supplies made by these manufacturers. There are two editions, one for coal mining, the other for the metallic and non-metallic mining and quarrying fields. Both editions, besides the condensed manufacturers' catalogs, contain extensive information regarding mining and quarrying methods and serve as handbooks of mining and quarrying practice.

The Coal Catolog is a handbook of the coal seams and coal mines of the country, giving the geology of the seams, the analysis and characteristics of the coal taken from them, and the advertisements of companies mining and selling coal. It forms an indispensable guide to economy in buying coal for fuel or processing purposes.

The Keystone company also publishes directories of the mining and quarrying fields and furnishes a list-addressing service for mailing circulars and other advertising matter for manufacturers.

In no sense do the catalogs replace or interfere with the educational function of *Engineering and Mining Journal-Press* and *Coal Age*. The catalogs furnish to the mining man, in one book and in convenient form, information that would otherwise have to be sought in a file of individual manufacturers' catalogs, inconvenient to keep and seldom complete. The Keystone Catalogs, by bringing the essential data together in condensed form and in one thoroughly indexed volume, makes the information contained instantly available.

That the Keystone service has been sound is attested by the growth and present size of the catalogs. The Coal Mining edition, in its last issue, contains 1,204 pages; the Metal-Quarry edition, 928 pages; the Coal Catalog, 1,293 pages. All of the volumes are of 9 by 12-in. page size.

From the standpoint of the manufacturer selling to the mining fields, the concentration of *Engineering and Mining Journal-Press* and *Coal Age*, the Keystone Catalogs, the Keystone directories, and the list service under one management offers the opportunity to secure from one organization a complete promotion and publicity plan, embracing educational and creative advertising, through the advertising pages of *Engineering and Mining Journal-Press* and *Coal Age*, reference advertising through the Keystone Catalogs, and direct-by-mail list service through mailing lists kept up to date week by week and rendered highly efficient through the manifold and direct sources of information of the magazines and catalogs. Such list sources could not, on account of the high cost, be duplicated by the manufacturer. These lists, which must be obtained by McGraw-Hill for its magazines and for the Keystone directories, and must be kept up currently, will now be available to manufacturers for their circular mail work at a cost negligible compared with the cost of compiling and maintaining their own lists.

Mr. Joseph J. Vigneau, the founder of the Keystone company and until now its president, will continue in charge of the Keystone business for the McGraw-Hill Co., with offices in Pittsburgh, while Mr. Ralph C. Becker, hitherto vice-president of the Keystone company, will continue in charge of sales, with headquarters in New York. Except for the retirement of Edward B. Day, New York representative, who leaves to devote his entire time to his company, the Hydrotator Co., New York, there will be no changes in the staff of the Keystone organization, but the service of the organization will be augmented by all the editorial and advertising resources and strength of the McGraw-Hill Co. All communications should continue to be addressed to the Keystone Consolidated Publishing Co., 800 Penn Ave., Pittsburgh, Pa.

New Machinery and Inventions

A New 4-Ton Gasoline Locomotive

A new 4-ton gasoline locomotive incorporating the Fordson engine and transmission parts has been announced by the Davenport Locomotive Works, Davenport, Iowa. In design it is simple and rugged, with all parts accessible. Balanced construction found in the larger locomotives of the manufacturer has been duplicated.

The design is also flexible, allowing the use of a canopy cab, a fully enclosed steel cab, or the removal of the cab altogether. The operating levers are placed within easy reach at the right hand side of the cab and clear vision is possible in all directions.

The locomotive has a speed range of 3 to 14 miles per hour and a maximum tractive power of 2,125 lb. Its operation is considered economical, starting on gasoline and running on kerosene.

Vibration Eliminated in Small Two-Cylinder Gas Engine

With the development of a two-cylinder 3 to 6-hp. gasoline power unit, shown in the accompanying illustration, the Novo Engine Co., Lansing, Mich., now has a complete line of multi-cylinder industrial gasoline engines ranging from 3 to 40 hp. The company claims to have overcome vibration in the two-cylinder engine by using the 180-deg. crankshaft.

The new power unit develops 3 to 6 hp. It is a two-cylinder, four-cycle "L" head, hopper or radiator-cooled gasoline engine. Crankshaft and power drive shaft run in roller bearings. Connecting rod bearings are of pressure cast babbitt, reamed and burnished. The cam shaft runs in brass bushings.

The engine has an independent drive

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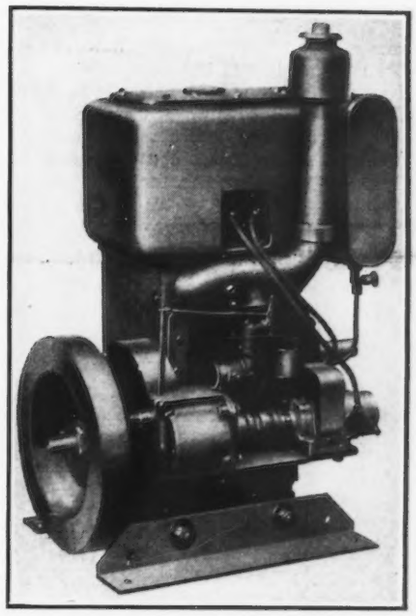

A new two-cylinder gas engine

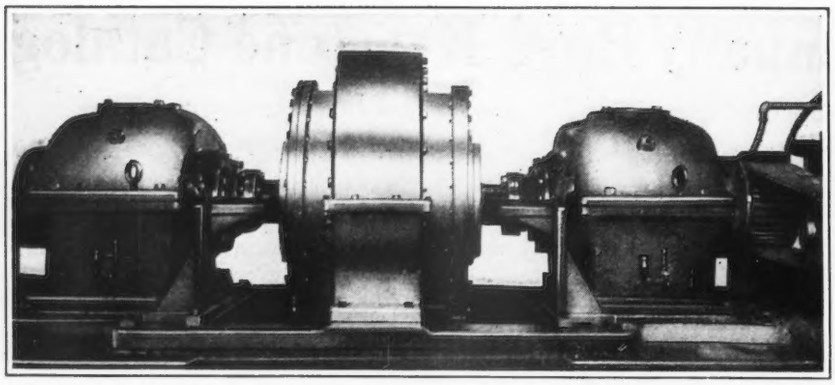

Fig. 1—The Laughlin continuous centrifgual filter

shaft. This can be placed on either the right or left side of the engine. The drive shaft can be furnished to rotate in either direction of rotation and at several different speeds. In all cases, the governor, carburetor, manifold and magneto side of the engine is away from drive-shaft side. In other words, the working parts of the engine are always accessible, whatever machine the engine is operating being on the other side of it.

The engine can be furnished to run the power drive shaft at 400, 600, 1,200 and 1,800 r.p.m. The 400-r.p.m. gear combination rotates the drive shaft, anti-clockwise, looking at the engine from the flywheel end. The 600 and 1,200 r.p.m. gear combinations may be had in either direction of rotation. The 1,800-r.p.m. gear combination rotates the drive shaft clockwise or right hand direction of rotation.

The crankshaft is of the opposed throw type, eliminating crankcase pressure, and making a well-balanced engine not hitherto found in two-cylinder engines. It runs at 1,200 r.p.m.

New Continuous Centrifugal Filter Introduced

Adapted for Use on Sand Slimes, Flotation Concentrates, Powdered Coal and Other Materials

A centrifugal machine for separating solids from liquids has recently been placed on the market by the Laughlin Filter Corporation, 120 Broadway, New York, N. Y.

This machine shown in Fig. 1 is a small, self-contained unit. It is centrifugal in action, operating at comparatively low speeds. The filtering action is continuous. No filter cloths, screens, or filtering mediums are necessary.

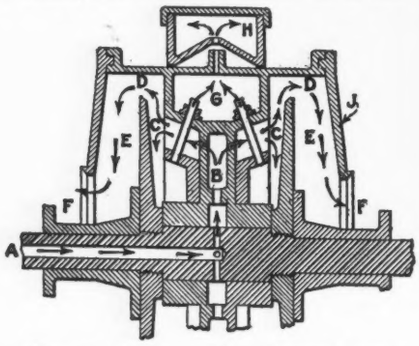

Fig. 2—Cross-section through continuous centrifugal filter

As detailed in the accompanying article, the mixture of liquid and solid enters at *A*, the liquids being discharged at *H* and the solids at *F*.

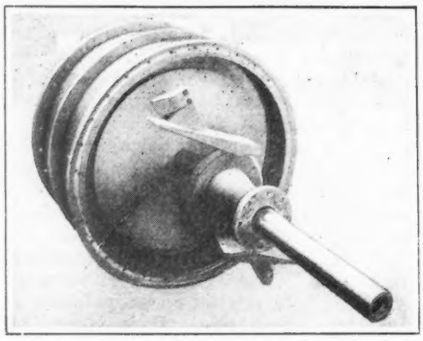

Fig. 3—Main rotating element of continuous centrifugal filter

The scraper arms used for removing the solid material are here shown pulled forward on the shaft from their correct position.

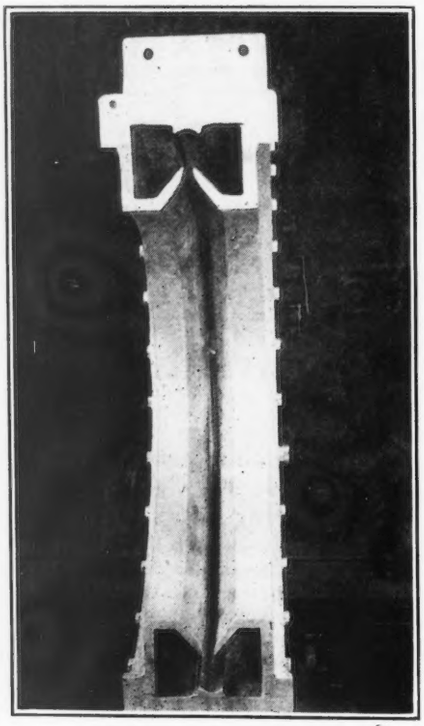

Fig. 4—Liquid discharge chamber of the continuous centrifugal filter

This casting is one-half of the complete discharge chamber, which completely surrounds the rotating element.

Fig. 2 shows a cross-section of the machine. Referring to this figure, the mixture to be filtered is fed in through the hollow shaft *A*, from which it passes to the annular chamber *B* by centrifugal force. The machine element *J* in which this chamber *B* is situated, shown in Fig. 3, together with the coverplates which are not shown in the figure, revolve with the shaft, to which they are affixed. This revolution throws the mixture out through the holes shown into passage *C* and hence against the annular surface *D*.

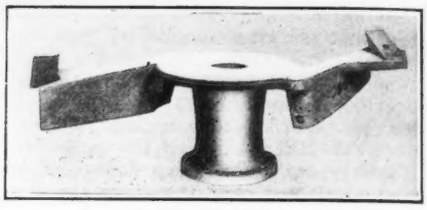

Fig. 5 — View of the scraper arm casting of the continuous centrifugal filter

This view shows clearly the auxiliary scraper pieces which, extending to the inner part of the filter chamber, serve to remove the cake from that part.

As the centrifugal force packs the mixture against the peripheral surface *D*, the liquid is forced out and drops back through *C*. The location causes it to pass into the chamber *G*, from whence it is discharged into the stationary liquid discharge chamber *H*, which is an annular casting in two parts, as shown in Fig. 4.

The solid matter is scraped from the peripheral surface *D* by the arms shown in Fig. 3 and shown in more detail in Fig. 5. These scraper arms revolve in the chamber *E*, with the main machine element, but at a slightly different speed, so that they make several complete revolutions per minute with reference to the surface *D*. The solid matter is guided by these arms toward the center and discharged through *F*.

The machine is particularly adapted for use with sand slimes, flotation concentrates, powdered coal, or any crystalline, fibrous or granular material that readily separates upon standing from the liquid with which it is mixed. With such materials a complete separation can be obtained. Where a large amount of comparatively dry solids is desired, the filter should follow a thickener. In this case, the liquid discharged from the filter is returned to the thickener for clarification. When handling materials of a colloidal nature, the addition of some granular element is an aid. The larger the amount of granular material present, the larger is the percentage of colloids removed in each cycle of treatment.

Trade Catalogs

Alloy Steel — Amsco "Fahralloy" castings for high temperature and corrosive processes are covered in a 4-page bulletin recently issued by the American Manganese Steel Co.

Gears—Cleveland worm gearing is described in a 15-page catalog (Bulletin 105) issued by the Cleveland Worm & Gear Co., Cleveland, Ohio.

The Market Report

New Year Buying Wave Not Yet Started

Prices Practically Unchanged for Copper, Lead, Zinc, and Tin, With Lead the Most Active Market

New York, Jan. 6, 1926—No rush to buy metals, following the quiet holiday period, is yet in evidence, though it is thought that substantial buying cannot be put off very much longer. In the meantime, most sellers are maintaining a firm policy, without cutting prices in an endeavor to get business. Sales of copper have been much better than last week, as two or three good-sized orders were booked, but the market has been dull for all that. Lead has again been slightly firmer and closely held, especially for early delivery. Zinc, silver, and tin have been quiet at about the same prices as last week. Among the minor metals antimony has continued its advance, going into a new high ground at 25c. per lb. for some spot sales. Aluminum, on the other hand, has been reduced a cent a pound.

Excellent domestic business is forecast for 1926 and is practically assured for the first half of the year, so that metal producers feel that they are likely to be even more prosperous than in 1925. The foreign markets have been disappointing in the last three or four months, but it would seem that the situation in Europe is more likely to improve than to get worse. Good export markets are particularly desired by the copper and zinc producers, though zinc prices have been maintained well recently without any foreign buying to speak of.

Daily Prices of Metals

Dec. Jan.	Copper N. Y. net refinery*	Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N.Y.	St. L.	St. L.
31	13.85	62.75	63.75	9.25	9.10	8.40@8.70
1	Holiday	.....	.....	....	....	.....
2	13.875	62.75	63.50	9.25	9.125	8.40@8.70
4	13.90	62.50	63.50	9.275	9.15	8.40@8.75
5	13.75@13.875	62.25	63.25	9.275	9.15	8.40@8.70
6	13.875	62.25	63.25	9.25	9.125	8.40@8.70
Av.	13.863	62.500	63.450	9.260	9.130	8.555

*The prices correspond to the following quotations for copper delivered: Dec. 31st, 14.10c.; Jan. 1st, Holiday; 2nd, 14.125c.; 4th, 14.15c.; 5th, 14.00@14.125c.; 6th, 14.125c.

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York cash, except where St. Louis is the normal basing point, or as otherwise noted. All prices are in cents per pound. Copper is commonly sold "delivered," which means that the seller pays the freight from the refinery to the buyer's destination.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. Quotations for lead reflect prices obtained for common lead, and do not include grades on which a premium is asked.

The quotations are arrived at by a committee consisting of the market editors of *Mining Journal-Press* and a special representative of the Bureau of Mines and the Bureau of Foreign and Domestic Commerce.

London

Dec. Jan.	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic						
	Spot	3M		Spot	3M	Spot	3M	Spot	3M
31	59 5/8	60 5/8	65 3/4	289 1/8	281 1/8	35 1/2	35 5/16	38 5/8	37 15/16
1	Holiday	...	...	....	....	....	....	....	....
4	59 3/4	60 3/4	65 3/4	289	281 1/2	35 3/4	35 5/16	39	38
5	59 3/4	60 3/4	65 3/4	288	281 3/8	35 7/16	35 1/16	38 15/16	38
6	59 1/2	60 1/2	65 1/2	288	280 3/4	35 5/16	35	38 3/4	37 7/8

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver, Gold, and Sterling Exchange

Dec. Jan.	Sterling Exchange "Checks"	Silver		Gold London	Jan.	Sterling Exchange "Checks"	Silver		Gold London
		New York	London				New York	London	
31	4.84 3/4	68 1/2	31 11/16	84s11d	4	4.84 5/8	68 3/8	31 13/16	84s11d
1	Holiday	...	....	84s11d	5	4.84 5/8	68 1/2	31 11/16	84s10½d
2	4.84 5/8	68 5/8	31 3/4	.....	6	4.84 1/2	68 1/2	31 11/16	84s10½d

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London silver quotations are in pence per troy ounce of sterling silver, 925 fine. Sterling quotations represent the demand market in the forenoon. Cables command three-eighths cent premium.

Average Metal Prices for December, 1925

Copper:	
New York Electrolytic	13.866
London Standard Spot	59.540
London Electrolytic Spot	65.625
Lead:	
New York	9.310
St. Louis	9.157
London Spot	34.739
London Forward	34.452
Silver:	
New York	68.889
London	31.835
Sterling Exchange	484.538
Zinc:	
St. Louis	8.565
London Spot	38.327
London Forward	37.452
Tin:	
99 per cent	61.952
Straits	62.928
London	284.920
Quicksilver	90.000
Antimony	21.692
Platinum:	
Refined	120.000
Crude	114.341
Aluminum, 98 per cent.	28.000

Copper 14⅛c. Delivered

Those who expected a sudden rush of either buying or selling after the holidays have been disappointed, as sales for the week have been about the same as for a quiet week in November or December. Some good orders, the largest of which was a booking of 1,500 tons by a telegraph company, were placed, and additional substantial business seems to be only awaiting a change in the market. Prices have shown little variation all week; most of the business at the higher freight rate points has been booked at 14¼c., whereas Connecticut deliveries have sold at 14⅛c. Important concessions have in some instances been made for deliveries near refineries or for business that is otherwise attractive, some copper having been sold for as low as 14c. delivered. In general, however, all sellers are united in quoting on a basis of 14⅛c. delivered Connecticut points, regardless of time of shipment. Much of the business has been placed for January-

February shipment, with somewhat less call for March. Consumers are not buying very far ahead, which, of course, makes the potential demand stronger and encourages sellers in firmly maintaining the price.

The foreign market has improved to about the same extent as the domestic. A small tonnage has been sold by producers' agencies at 14.325c., c.i.f., with some business reported by dealers at slightly lower figures. German demand continues disappointing.

Lead Active in Middle West

Lead seems to be the first of the metals in which buying in good volume has started following the holidays, the St. Louis market being noticeably more active than New York. While the carload-lot business is not so apparent, the larger users all seem to be in the market, the demand for January lead being strong. The important producers have no large supply for this position, but are fairly free sellers for February delivery at current quotations. Some buyers who specify desilverized lead in preference to other grades have been paying premium prices over the 9.125c. which the leading producer in the Middle West is quoting to its regular customers. Some lots of soft Missouri for prompt shipment also have brought 9.20c. and 9.225c. St. Louis. The American Smelting & Refining Co. maintains its official contract price at 9.25c. New York City. Here too 9.325c. and 9.35c. have been realized on fair-sized shipments. London has fluctuated up and down, but the domestic market is still amply high to attract foreign ore lead. There seems to be no difficulty, however, in absorbing this extra supply. The $3 premium on corroding grades is easily maintained.

Prompt Zinc 8.70@8.75c.

The zinc market has been practically unchanged for more than a month, and seems likely to remain so until foreign demand reasserts itself. Producers are well sold up, and the scarcity of metal for early delivery makes the quotation of 8.70@8.75c. for prompt zinc a particularly firm one. Most of the rather limited buying has been for February, which has commanded about 8.55c., with a little business reported for March at 8.40@8.45c. Doubtelss a slightly greater concession would be made for April, but consumers have so far not been interested. Business in Brass Special has been extremely quiet, with quotations about 20 points above Prime Western. High-grade continues unchanged at the prices which have obtained for almost three months—10¼@10½c. New York deliveries of Prime Western continue at the freight differential of 35c. per 100 lb. above St. Louis.

Tin Market Dull

Business in tin has been exceedingly small during the week ended today, although the price has declined but little. February and March deliveries are from 0.50 to 0.75c. below the spot quotations. The excellent statistical position is indicated in the recently announced figures, which show domestic deliveries for the year to be 76,000 long tons, compared with 64,000 in 1924 and 70,000 in 1923. An increase in tin-plate production of 10 per cent during 1925 accounts in large measure for the bigger consumption.

Silver Steady

The silver market this week has been devoid of special feature, and prices have fluctuated within extremely narrow limits. China has not been a factor for the last few days. India, however, has bought small amounts and appers to be interested on a somewhat larger scale at prices slightly below the present market. Undertone firm without decided tendency.

Mexican Dollars: Dec. 31st, 52½c.; Jan. 1st, holiday; 2d and 3d, 52⅝c.; and 6th, 52½c.

Foreign Exchanges Dull

Foreign exchanges have been dull recently. Closing cable quotations on Tuesday, Jan. 5, were: francs, 3.81c.; lire, 4.03¾c.; and marks, 23.805c. Canadian dollars declined to $\frac{3}{16}$ per cent discount, a new low for the movement. Further declines are expected, but the discount is not likely to reach 1 per cent, according to experts. The movement is largely a seasonal one.

Zinc Blende and Lead Ore Unchanged

Joplin, Mo., Jan. 2, 1926

Zinc Blende	Per Ton
High	$60.90
Premium, basis 60 per cent zinc	$57.00@$58.00
Prime Western, basis 60 per cent zinc	$56.00
Fines and slimes, 60 per cent zinc	$54.00@$51.00
Average settling price, all	$54.80

Galena	
High	$119.50
Basis 80 per cent lead	$115.00
Average settling price, all	$116.94

Shipments for the week: Blende, 11,431; lead, 3,745 tons. Value, all ores the week, $1,064,320. Zinc shipments are 3,870 tons less and those of lead 928 tons more than in the same week last year.

Owing to a majority of the mills being idle all the week on account of the holidays, production was only 7,000 tons of blende for this week. While the mills were idle many producers prosecuted work in the ground, and this may show maximum production next week.

There are yet approximately 10,000 tons of unsold lead in the bins awaiting a higher price level, which is nearly equal to the 14,300 tons of zinc, a part of which is sold. The larger producers of zinc also are holding their ore for an advancing market.

Platteville, Wis., Jan. 2, 1926

Zinc Blende	Per Ton
Blende, basis 60 per cent zinc	$58.50

Lead Ore	
Lead, basis 80 per cent lead	$120.00

Shipments for the week: Blende, 852 tons; lead, 40 tons. Shipments for the week to separating plants, 1,314 tons blende.

[1]Price furnished by Foote Mineral Co., Philadelphia.

Steel Steady—Pig Iron Quiet

Pittsburgh, Jan. 5, 1926

The steel market has not picked up much in activity, having grown quiet before the holidays. There is no change in underlying conditions or in prospects, all circumstances remaining favorable.

Steel prices are on the whole as steady as formerly. There is no distinct advancing tendency in any line. In sheets, while most mills are well sold up, a few are not, and concessions by these mills are slightly more in evidence. In merchant bars less progress than expected has been made in establishing 2.10c., as the price on ordinary lots, contracts having been made with large buyers for the quarter at 2c.

Mill operations continue at approximately the rate reached in November, this being only a few per cent under the record high ever struck.

Among all the steel-consuming lines there is a high rate of activity, except where weather interferes, and excepting also the freight-car shops, which have more business than three months ago, but still not a great deal.

Pig Iron—The market remains quiet. Furnace stocks have been decreasing in the past three months. Furnaces are moderately well sold up for the quarter. Bessemer, $21; basic, $20; foundry, $20.50, f.o.b. Valley furnaces.

Connellsville Coke — Production has picked up since the holiday restriction, and the market is easier, at $4.50@$4.75 for furnace coke and $5.50@$6 for foundry coke, spot shipment.

Other Metals

Quotations cover large wholesale lots, f.o.b. New York, unless otherwise specified.

Aluminum—99 per cent, 28c. per lb.; 98 per cent, 27c. London, 98 per cent, £118 long ton. Domestic demand good; 1c. cut by trust on Jan. 2 was unexpected in the trade. Fair business in Great Britain.

Antimony—Per lb.: Chinese brands, spot, 23¾@25c.; February arrival, 23½@24½c. Cookson's "C" grade, spot, 23½@25c.

Chinese needle, lump, 15@16c. Standard powdered needle, 200 mesh, 19½@20c. White oxide, Chinese, 99 per cent Sb_2O_3, 19@19½c.

Bismuth—$3.30@$3.35 per lb. in ton lots. London, 12s. 6d.

Cadmium — 60c. per lb. London, 1s. 9d. for Australian metal.

Cobalt—Shot, 96@98 per cent, $2.50 per lb. Black oxide, 70 per cent, $2.20; gray oxide, 75 per cent, $2.35. London, 10s. for metal; 8s. for black oxide; 8s. 10d. for gray. Market quieter.

[1]**Germanium Oxide**—25 to 50 gm. lots, $6 per gm.

Iridium—$375@$380 per oz. for 98@99 per cent. Nominal. London, £80@£85 for 99.5 per cent.

[1]**Lithium**—95@96 per cent grade in 1 to 5 lb. lots, $65 per lb.

Magnesium — Ingot, 99.85 per cent, 90c. per lb. in ton lots. Market steady.

London, 3s. 9d.@4s. 3d. for 99 per cent ingots or sticks.

[1]**Molybdenum**—99 per cent, $25 per kg.; C. P. metal, $80 per kg.

Monel Metal — Base price for shot, 32c. per lb.

Nickel—Ingot, 35c.; shot, 36c.; electrolytic, 39c. (99.75 per cent grade). Market firm. London, £170@£175 per long ton, according to quantity.

Osmium—$110 per oz.; London, £23 10s.@£25 10s.

Palladium—$78@$82 per oz. Crude, $60@$65 per oz. London, £17, nominal.

Platinum — Refined, $120 per oz. officially quoted. Sales also at $115@$118. Crude, $114@$114.50.

London, £23 10s. per oz. for refined, and £22 for crude. Demand limited.

Quicksilver—Per 75-lb. flask, $88@$89. London, £14 15s.@£15. San Francisco wires $91. Market is quiet; spot metal scarce.

Radium—$70 per mg. radium content.

Rhodium—$80@$95 per oz.; London, £18@£22.

Ruthenium—$95@$105 per oz.; London, £16½@£19½.

[1]**Selenium**—Black powdered, amorphous, 99.5 per cent pure, $1.95 per lb. in ton lots.

Tellurium—$2 per lb.

[1]**Thallium Metal**—Ingot, 99 per cent pure, $6 per lb. in 25-lb. lots.

Tungsten Powder—97 to 98 per cent pure, $1.18@$1.20 per pound.

[1]**Zirconium Metal**—98 per cent grade, per lb., $30, in 5 to 10 lb. lots.

Metallic Ores

Chrome Ore—Crude, 45 to 50 per cent Cr_2O_3, $22.50@$23 per net ton, f.o.b. shipping point. Demand good.

New Caledonian, 52-54 per cent Cr_2O_3, $24; nominal.

[1]**Galena Radio Crystals**—Best quality (50 per cent of sized fragments good) 50c. per lb. in 500-lb. lots, f.o.b. Philadelphia.

Iron Ore—Lake Superior ores, per long ton, lower Lake ports:

Mesabi, non-bessemer, 51½ per cent iron, $4.25. Old Range, $4.40.

Mesabi, bessemer, 51½ per cent iron, $4.40. Old Range bessemer, 51½ per cent, $4.55.

High-phosphorus foundry, over 0.18 per cent P, $4.15.

Stocks at Lake ports greatly reduced and higher prices expected next season.

Eastern ores, cents per unit delivered at furnaces: Foundry and basic, 53 to 63 per cent, 9@10c.

Foreign ores, f.o.b. cars Atlantic ports, cents per unit:

Swedish and Norwegian, low-phosphorus, 68 per cent, 11@11½c.

Spanish and Algerian, low-phosphorus, 52@54 per cent, 9@10c.

Spanish foundry or basic, 50@54 per cent, 8½@9c.

Swedish foundry or basic, 66@68 per cent, 9@10c.

Manganese Ore—Per long ton unit of Mn, c.i.f. North Atlantic ports: Brazilian, 42@44c., nominal; Indian, 44c., nominal; Caucasian (unwashed), 40c.; Caucasian (washed), 43c.; market has been dull.

Chemical grades[1], powdered, coarse or fine, 82@87 per cent MnO_2, Brazilian and Cuban, $70@$80 per ton in carloads.

Molybdenum Ore—65@70c. per lb. of MoS_2 for 85 per cent MoS_2 concentrates, f.o.b. mines.

[1]**Pyrite Radio Crystals**—50c.@$1 per lb.

Tantalum Ore—Foreign, 75c. per lb. of Ta_2O_5 contained, c.i.f. New York.

Tungsten Ore—Per unit of WO_3, N.Y.: Wolframite, $11.50@$12.50.

Scheelite, $12.50@$12.75. Prices firm; market remains quiet, with small domestic demand.

Vanadium Ore—Minimum 18 per cent V_2O_5, $1@$1.25 per lb. V_2O_5. Nominal.

Non-Metallic Minerals

Prices received for non-metallic minerals vary widely and depend upon the physical and chemical characteristics of the commodity. Hence the following quotations can only serve as a general guide to the prices obtained by producers and dealers in different parts of the United States for their own product. In the last analysis the value of a particular non-metallic mineral can only be ascertained by direct negotiation between buyer and seller.

[1]**Amblygonite**—8@9 per cent lithium oxide, $50@$60 per ton, f.o.b. mines.

Andalusite—Sorted, $45@$50 per ton, f.o.b. *South Dakota* mines. Sales mostly for experimental lots.

Asbestos—F.o.b. *Quebec* mines, tax and bags included, per ton:

Crude No. 1, $500@$525; crude No. 2, $300@$325; spinning fibers, $175@$200; magnesia and compressed sheet fibers, $125; shingle stock, $75; paper stock, $40@$45; cement stock, $25; short fibers, $12.50@$17.50; floats, $15.

The market is good and prices are higher and firm, as consequence of consummation of merger. A scarcity of low-grade material is reported.

No. 1 Rhodesian crude, $325; No. 2, $250 per ton, c.i.f. New York.

Barytes—F.o.b. mines, per ton, bags extra:

South Carolina: Crude, $7@$8 per gross ton; ground, off color, $14@$17 per short ton.

North Carolina: White bleached, $22 per short ton; white natural, $20.

Georgia: Crude barytes ore, $7.50. Good demand but foreign competition has cut price.

Missouri: Water ground and floated, bleached, $23; $25 in less than car lots, f.o.b. works.

Canada: 94@96 per cent $BaSO_4$, $9 per net ton, f.o.b. mine.

Bauxite — American, f.o.b. shipping point per gross ton: Crushed and dried, $5.50@$8.50; pulverized and dried, $14; calcined, crushed, $17@$20.

Foreign, per metric ton, c.i.f.: Dalmatian, low SiO_2, $5@$6.50; Istrian, $5.50@$7; French, red, $6@$7.50.

Dutch Guiana bauxite offered at $8.50 per long ton, c.i.f. *New York.*

Borax—Carload lots, in bags, per lb.: crystals, 5c.; granulated or powdered, 4¾c.; f.o.b. plant, *Illinois.*

[1]**Celestite**—90 per cent $SrSO_4$, finely powdered, $30 per ton in carload lots.

[1]Price furnished by Foote Mineral Co., Philadelphia.

Chalk—Crude, in bulk, per ton c.i.f. New York, $4.75@$5.

China Clay (Kaolin)—F.o.b. *Virginia* mines, per ton: crude, lump, No. 1, $7; crude No. 2, $5.50; washed, $8; powdered and air-floated, $10@$20; ground, $7@$10.

Imported English, f.o.b. American ports: Lump, $11.50@$21; powdered, $45@$50. Demand good.

Georgia, washed lump, $8.65; *Florida*, washed lump, $13.50.

1A grades, domestic, $16@$17, f.o.b. *Delaware* plants. Market slower.

Diatomaceous Earth—Per short ton, f.o.b. plant, *California:*

Kiln-fired brick, $65; kiln-fired aggregate, ¼ in., $45; insulating powder, $30; natural aggregate, ¼ in., $20; air-floated powder, $40; "Calatom" (mill run), $20; "Calatom," 3b, $30.

Emery — F.o.b. *Pennsylvania* and *New York* in 350-lb. kegs, per lb.: Greek Naxos, 6½c.; Turkish, 6½c.; Khasia, 5½c.; domestic, 3½@4c. Market good.

Feldspar — F.o.b. mine or grinding plant:

North Carolina: No. 1 pottery grade, $6@$6.50 per long ton, depending upon quality. Market fair.

New Hampshire: No. 1, not over 10 per cent SiO_2, $8 per short ton. Ground, $17. Market fair.

New York: Per ton, f.o.b. cars, No. 1 crude, $8. Market good.

Maine: No. 1, ground, $19 per ton. Heavy demand.

Tennessee: No. 1 pottery, $16@$18 per ton for 140 and 200 mesh respectively. No. 1 enamel, 140 mesh, $14; 200 mesh, $16. Competition keen with some cutting of prices to get business, but demand good.

Maryland: 140 mesh, $18@$22; 120 mesh, $16; 60 to 100 mesh, $12@$15.

Canada, f.o.b. mine: High potash, $9, per ton, f.o.b. Quebec; crude, No. 1, over 12½ per cent potash, less than 5 per cent free SiO_2, $7.50@$8; crude, No. 2, 20 to 25 per cent free SiO_2, $6.25@$6.50.

Ground, No. 1, 180 mesh, $20.50 per ton, bags included; demand very active for first-grade feldspar.

Fluorspar—F.o.b. *Kentucky* and *Illinois* mines, per ton:

Gravel, not less than 85 per cent CaF_2, and not over 5 per cent SiO_2, $17.50. Foundry lump, 85-5, $20. Ground, 95 to 98 per cent CaF_2, and not over 2½ per cent SiO_2, $32.50. Acid ground packed in bags, $40@$45. Prices firm. Many large buyers covered for first quarter of 1926.

Canada: 84@86 per cent CaF_2, less than 5 per cent silica, $16.

New Mexico: 85-5 lump or gravel, $15 f.o.b. mines. Ground, 96 per cent through 100 mesh, $35. Market poor.

Fuller's Earth—Per ton, f.o.b. *Midway, Fla.:* 16 to 30 mesh, $16.50; 30 to 60 mesh, $18; 60 to 100 mesh, $15; 100 mesh "up," $8; 200 mesh "up," $15. Market somewhat stronger.

Powdered, imported, duty paid, $23@$25 per ton.

Garnet—Per ton f.o.b. mines: Domestic, $85; *Canadian*, $70@$80.

Metal Statistics

Monthly Average Prices of Metals

Silver

	New York		London		Sterling Exchange	
	1924	1925	1924	1925	1924	1925
January	63.447	68.447	33.549	32.197	425.524	477.702
February	64.359	68.472	33.565	32.245	430.457	476.886
March	63.957	67.808	33.483	31.935	428.769	477.279
April	64.139	66.899	33.065	31.372	434.788	479.034
May	65.524	67.580	33.870	31.276	435.716	484.960
June	66.690	69.106	34.758	31.863	431.675	485.553
July	67.159	69.442	34.509	31.954	436.649	485.514
August	68.519	70.240	34.213	32.268	449.510	485.264
September	69.350	71.570	34.832	32.983	445.740	484.270
October	70.827	71.106	35.387	32.972	448.274	483.909
November	69.299	69.223	33.775	32.155	460.543	484.201
December	68.096	68.889	32.620	31.835	469.115	484.538
Year	66.781	69.065	33.969	32.088	441.397	482.426

New York quotations, cents per ounce troy, 999 fine, foreign silver. London pence per ounce, sterling silver, 925 fine.

Copper

	New York		London			
	Electrolytic		Standard		Electrolytic	
	1924	1925	1924	1925	1924	1925
January	12.401	14.709	61.273	66.065	67.193	70.607
February	12.708	14.463	63.113	64.713	68.167	69.525
March	13.515	14.004	66.137	62.892	72.087	67.739
April	13.206	13.252	64.338	60.575	70.150	64.194
May	12.772	13.347	62.006	60.131	67.648	63.560
June	12.327	13.399	61.375	59.899	66.313	63.369
July	12.390	13.946	61.652	61.467	65.815	65.750
August	13.221	14.490	63.481	62.613	67.800	68.169
September	12.917	14.376	62.750	61.886	67.125	67.693
October	12.933	14.300	62.641	61.977	66.620	67.523
November	13.635	14.353	63.731	61.280	68.063	67.893
December	14.260	13.866	65.295	59.540	69.762	65.625
Year	13.024	14.042	63.149	61.920	68.062	66.804

New York quotations, cents per pound. London, pounds sterling per long ton.

Lead

	New York		St. Louis		London	
	1924	1925	1924	1925	1924	1925
January	7.972	10.169	8.002	9.953	31.528	41.443
February	8.554	9.428	8.643	9.126	34.589	37.944
March	9.013	8.914	8.891	8.578	37.161	36.804
April	8.263	8.005	7.932	7.662	32.819	32.791
May	7.269	7.985	6.973	7.780	29.426	32.283
June	7.020	8.321	6.948	8.024	32.138	33.479
July	7.117	8.151	6.886	8.054	32.916	34.698
August	7.827	9.192	7.764	9.284	32.728	38.188
September	8.000	9.508	7.876	9.303	33.023	38.884
October	8.235	9.513	8.118	9.299	35.715	39.017
November	8.689	9.739	8.590	9.578	39.425	36.872
December	9.207	9.310	9.106	9.157	41.583	34.739
Year	8.097	9.020	7.969	8.817	34.421	36.429

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Tin

	New York				London	
	99%		Straits			
	1924	1925	1924	1925	1924	1925
January	48.250	57.692	48.750	58.250	246.790	265.560
February	52.772	56.517	53.272	57.068	272.399	262.181
March	54.370	53.038	54.870	53.733	277.429	245.682
April	49.457	51.380	49.957	52.135	250.863	237.006
May	43.611	53.675	44.111	54.620	218.511	245.476
June	42.265	54.885	42.765	55.957	219.219	252.476
July	45.750	56.683	46.250	58.014	233.332	258.435
August	51.409	56.649	51.909	58.190	254.638	258.538
September	48.595	56.405	49.095	58.247	243.511	259.182
October	50.038	60.462	50.538	62.274	248.543	277.722
November	53.848	62.136	54.348	63.304	257.738	284.506
December	55.721	61.952	56.245	62.928	261.875	284.920
Year	49.674	56.790	50.176	57.893	248.737	260 974

New York quotations, cents per pound. London, pounds sterling per long ton.

Zinc

	St. Louis		London		
	1924	1925	1924	1925 Spot	1925 3 M
January	6.426	7.738	34.761	37.917	.....
February	6.756	7.480	36.518	36.528	.....
March	6.488	7.319	35.298	35.741	.....
April	6.121	6.985	32.588	34.644	.....
May	5.793	6.951	30.648	34.223	.....
June	5.792	6.990	31.788	34.149	.....
July	5.898	7.206	32.193	34.894	34.511
August	6.175	7.576	32.544	36.691	36.219
September	6.181	7.753	32.926	37.435	36.719
October	6.324	8.282	33.514	39.884	38.656
November	6.796	8.614	35.022	39.039	38.304
December	7.374	8.565	36.932	38.327	37.452
Year	6.344	7.622	33.728	36.624	.....

St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Antimony, Quicksilver and Platinum

	Antimony (a) New York		Quicksilver (b) New York		Platinum (c) Refined New York		Platinum (c) Crude
	1924	1925	1924	1925	1924	1925	1925
January	10.279	17.428	59.500	81.596	122.115	117.000	111.663
February	10.935	19.795	59.565	79.386	124.739	117.000	114.216
March	11.442	15.553	64.269	80.481	121.692	117.000	115.000
April	9.952	12.533	74.308	82.327	115.577	118.269	114.769
May	8.755	15.770	76.962	81.360	115.731	119.850	115.000
June	8.403	16.500	73.720	83.154	116.000	120.000	115.000
July	8.477	17.779	72.173	83.077	118.231	120.000	114.346
August	9.839	17.683	72.096	82.317	120.000	120.000	113.538
September	11.022	17.143	72.423	81.730	118.923	120.000	113.710
October	11.519	18.029	70.654	83.856	118.000	120.000	113.918
November	14.385	20.000	68.708	88.250	117.792	120.000	114.000
December	15.024	21.692	72.750	90.000	117.000	120.000	114.341
Year	10.836	17.494	69.761	83.128	118.817	119.093	114.125

(a) Antimony quotations in cents per pound for ordinary brands. (b) Quicksilver in dollars per flask. (c) Platinum in dollars per ounce.

Pig Iron, Pittsburgh

	Bessemer		Basic		No. 2 Foundry	
	1924	1925	1924	1925	1924	1925
January	24.76	24.66	23.76	23.76	23.88	23.76
February	25.26	24.50	23.76	23.26	25.06	23.76
March	25.14	24.06	23.76	23.06	24.76	22.91
April	24.56	22.89	23.26	21.76	23.80	22.26
May	23.89	21.57	22.08	20.26	22.91	21.16
June	22.90	20.76	21.49	19.76	21.48	20.11
July	21.90	20.76	20.76	19.76	20.76	20.26
August	21.76	20.76	20.76	19.76	20.99	20.26
September	21.76	21.04	20.76	20.03	21.68	20.50
October	21.76	21.50	20.26	20.37	21.26	20.83
November	22.08	22.64	21.44	21.58	21.17	22.08
December	23.65	22.76	22.04	21.76	22.86	22.26
Year	23.28	22.33	22.01	21.26	22.55	21.68

In dollars per long ton.

Monthly Crude Copper Output in Short Tons

Domestic

	1925					
	June	July	Aug.	Sept.	Oct.	Nov.
Alaska shipments	2,848	3,643	67	5,496	3,140	4,677
Calumet & Arizona	1,924	1,876	1,970	....	....	....
Miami	2,190	1,861	2,350	2,088	2,052	2,090
New Cornelia	3,115	2,834	2,460	....	....	....
Old Dominion	1,381	1,120	1,030	1,371	1,097	958
Phelps Dodge	7,214	6,878	6,600	6,748	6,636	6,500
United Verde Extension	1,565	1,931	1,928	1,865	1,797	1,632
Tennessee Copper	....	549	610	585	596	573
Imports: Ore and concentrates, matte	6,898	5,261	6,485	4,340	5,970	6,597
Imports of black and blister, unrefined	26,349	16,796	23,309	16,815	14,990	14,296
Imports of refined and old	7,298	2,461	4,348	5,440	4,678	6,972

Foreign

Boleo, Mexico	847	791	832	858	854	798
Furukawa, Japan	1,390	1,615	1,409	1,575	1,613	....
Granby Cons., Canada	1,653	1,620	1,669	1,495	1,738	1,396
Katanga, Africa	9,415	9,045	10,165	8,284	8,703	8,207
Mount Morgan, Aust	403	415	272	....	....	....
Mount Lyell, Aust	2,021(a)	....	....	2,076(a)	....	....
Phelps Dodge, Mexican	1,764	1,982	2,118	1,963	1,822	2,224
Sumitomo, Japan	1,412	1,570	1,691	1,011	....	....

(a) Three months.

Monthly Production of Primary Copper from U. S. Mines and Daily Rate (Short Tons)

	1923		1924		1925	
	Monthly Production	Daily Rate	Monthly Production	Daily Rate	Monthly Production	Daily Rate
January	56,134	1,811	66,631	2,149	74,789	2,412
February	51,368	1,834	65,681	2,265	68,967	2,463
March	60,781	1,961	65,181	2,103	74,901	2,416
April	59,078	1,969	66,073	2,202	70,667	2,356
May	62,718	2,023	65,608	2,116	70,574	2,276
June	62,740	2,091	63,933	2,131	69,894	2,330
July	63,071	2,034	64,787	2,090	68,507	2,210
August	65,865	2,125	66,756	2,153	68,090	2,196
September	62,255	2,075	63,800	2,127	67,720	2,272
October	66,035	2,130	68,989	2,225	70,819	2,284
November	63,885	2,129	68,291	2,276	67,897	2,263
December	64,832	2,091	67,647	2,182	.....	.....
Total	738,763	.....	793,377	.....	772,825	.....
Monthly average	61,564	.....	66,115	.....	70,257	.....
Average of daily rate	.....	2,024	.....	2,168	.....	2,318

Spanish grades, $60, c.i.f. port of entry.

Gilsonite—Per ton, carload lots, f.o.b. mines *Colorado:*

Jet asphaltum, $36; selects, $33; seconds (ordinary grades), $25.50; peerless black, $32.90. Market steady.

Graphite—F.o.b. New York per lb.:

Ceylon lump, 9@9½c.; chip, 7@7½c.; dust, 3@6c. Market active.

Flake, 12@30c. according to grade; fine ground crystalline, 8@25c.; amorphous ground graphite, 5@15c. Crude amorphous graphite, $15@$35 per ton according to grade.

Prices have risen about 50 per cent during past year. Higher labor costs in Ceylon and Madagascar have been factor.

Greensand—Per ton, f.o.b. cars, *New Jersey:* screened and bagged, $20 in carload lots.

Gypsum—Per ton f.o.b. mill, depending upon location: crushed, $1.50@$3; ground, $4@$6; agricultural, $6@$12; calcined, $8@$13.

[1]**Ilmenite**—Concentrates, 52 per cent TiO_2, 1½c. per lb., f.o.b. *Virginia* points. $60 per short ton, *Florida* mines.

Iron Oxide (See Ocher)—Standard Spanish red, 3@4c. per lb.; domestic earth, 2@4½c.

Kaolin—See China Clay.

[1]**Lepidolite**—$20@$30 per ton for ordinary grades. Nominal.

Limestone—F.o.b. shipping points, depending on location: crushed, ½ in. and less, 90c.@$2; 3 in. and larger, 90c. @$1.80 per ton.

Agricultural, $1.50@$5 for pulverized; $0.75@$2 for crushed, depending upon source, purity, and fineness.

Magnesite—Per short ton, f.o.b. *California* mines: Grade "A," 80 per cent through 200 mesh, $40@$42; Grade "B," $38; market improving.

Dead-burned, $40, f.o.b. Eastern seaboard. Market unsettled.

Manjak—Barbados, in 10-ton lots, c.i.f. New York: grade "A," 6c. per lb.; grade "AA," fine, 8½c.

Mica—F.o.b. plant, per ton:

North Carolina: 20 mesh, roofing, $38; 100 mesh, white ground, $70. Market good.

New Hampshire: Mine run, $320, clean shop scrap, $25; mine scrap, $20. White, dry ground, 20 mesh, $35; 40 mesh, $45; 60 mesh, $60; 100 mesh, $75; 200 mesh, $85. Outlook good for 1926.

Madagascar, amber, dark, free from iron, per lb., f.o.b. *New York*, duty paid: special grade, $3@$3.25; No. A 1, $2.75; No. 1, $2.50; No. 2, $2.20; No. 3, $1.20; No. 4, 60@70c. No. 5, 42@45c. Grades depend on size of sheets.

[1]**Monazite**—Minimum 6 per cent ThO_2, $120 per ton.

Ocher — F.o.b. *Georgia* mines, per ton: $22.50@$25 in sacks; $25@$30 in barrels; washed and water floated, $25 @$28. Market good.

Phosphate—Per long ton, f.a.s. or f.o.b. mines:

Florida, pebble, f.a.s., for export: 76@77 per cent, $6.30; 75 per cent, $5.65; 74@75 per cent, $5.40; 70 per cent, $3.75; 68 per cent, $3.50. Market firm; prices up slightly for lower grades.

Florida, pebble, domestic: 76@77 per cent, $5.75; 75 per cent, $5; 74@75 per cent, $4.75; 70 per cent, $3.

Tennessee, lump, ¾-in. screen, base 75 per cent, $6. Ground, 95 per cent through 200 mesh, base 65 per cent, $7. Mines increasingly active.

Potash—	Bags	Bulk
Muriate of potash 80@85 per cent, basis 80 per cent....	$34.90	$33.65
Sulphate of potash 90@95 per cent, basis 90 per cent....	45.85	44.60
Sulphate of potash-magnesia 48@53 per cent, basis 48 per cent	26.35	25.10
Manure salt 30 per cent.....	20.00	18.00
Manure salt 20 per cent.....	13.35	11.35
Kainit 14@16 per cent.....	10.50	8.50
Kainit 12.4 per cent.....	10.00	8.00

Two thousand pounds net weight, c.i.f. Atlantic and Gulf ports. German weights, tares and analyses.

Discounts: 5 per cent on minimum of 50 tons K_2O; 6 per cent on 100 tons; 7 per cent on 300 tons; 10 per cent on 500 tons. Prices guaranteed against sellers' decline until April 30, 1926. Strong undertone to market.

Pumice Stone—In barrels, per lb., powdered, 3@5c.; selected lumps, 6@ 8c.; lumps in bags, 4@6c.

Pyrites—Tharsis, per long ton unit of sulphur, c.i.f. U. S. ports: furnace size, 13½c. Cinder from ore to remain property of buyers. Market stronger, with good inquiry.

[1]**Quartz Rock Crystals**—Colorless, clear and flawed, pieces ¼ to ½ lb. in weight, 40c. per lb. in ton lots. For optical purposes, double above prices.

Rutile—*Virginia*, per lb.; granular, 94@96 per cent TiO_2, 12@15c.; pulverized, 100 mesh, 94@96 per cent, 17@ 30c.

Florida 93 per cent TiO_2, $200 per ton.

Silica—Water ground and floated, per ton in bags f.o.b. *Illinois:* 450 mesh, $31; 350 mesh, $26; 250 mesh, $22.

Glass sand, $1@$5 per ton; brick and molding sand, 30c.@$2; blast sand, $2.50@$4.50.

[1]**Spodumene**—$20@$30 per ton, depending upon lithium content. Nominal.

Sulphur—$16 per ton for domestic, f.o.b. *Texas* mines; $20 for export, f.a.s. *New York*. Good shipment against contracts. Open prices $1 higher.

Talc—Per ton, carload lots, f.o.b. works, containers included:

Vermont: 200 mesh, extra white, $11; 180 mesh, medium white, $10; packed in 50-lb. paper bags. Demand fair but prices steady.

New York: Double air-floated, 100 mesh, $11.25; 200 mesh, $13.75; 325 mesh, $14.75. Demand fair.

Georgia: Powdered, gray, $7.50@$10; yellow, $9@$12; red, $11@$13; roofing, $7.50@$9. Market fair.

New Jersey: Soapstone, ground, $10@$12; market fair.

Tripoli—Per short ton, burlap bags, paper liners, minimum carload 30 tons, f.o.b. *Missouri*: Once ground through 40 mesh: rose and cream colored, $16. Double ground through 110 mesh: rose and cream, $17. Air-floated through 200 mesh: rose and cream, $25; mill run, $15. Active business at lower prices.

[1]**Zircon**—Freight allowed east of Mississippi River: 95 per cent, 3c. per lb., f.o.b. mines, in carload lots.

[1]Price furnished by Foote Mineral Co., Philadelphia.

Mineral Products

Arsenious Oxide (white arsenic)—3c. per lb. London £14½@£15 per long ton.

Copper Sulphate — Large crystals, 4.40@4.70c. per lb.; small, 0.1c. less.

Sodium Nitrate—Spot, crude $2.46 per 100 lb., ex vessel Atlantic ports.

Sodium Sulphate—$1.20@$1.30 per 100 lb., f.o.b. works, for Glauber's salt.

Zinc Oxide—Per lb. in bags: Lead free, 7¼c.; 35 per cent leaded grades, 8c.; French in car lots, 10⅛@12⅜c.

Ferro-Alloys

[1]**Ferrocerium**—$7 per lb.

Ferrochrome—1@2 per cent carbon, 23@25c. per lb. of contained chromium; 4 to 6 per cent carbon, 11½c. per lb; 0.1 per cent, 35c. per pound.

Ferromanganese—Domestic and foreign, 78@82 per cent, $115 per gross ton. Spiegeleisen, 19@21 per cent, $33@$34 f.o.b. furnace; 16@19 per cent, $32.

Ferrophosphorus—Electrolytic, 18 per cent P, $91 per ton; 24 per cent, $122.50; f.o.b. Ala. and Tenn.

Ferrosilicon—14 to 16 per cent, $42 @$47 per gross ton, f.o.b. works; 50 per cent, $85 delivered; 75 per cent, $145. Market active.

Ferrotitanium—For 15 to 18 per cent material, $200 per ton, f.o.b. Niagara Falls, N. Y.

Ferrotungsten—$1.12@$1.17 per lb. of contained W, f.o.b. works, according to grade.

[1]**Ferro-uranium**—30 to 40 per cent U, $4.50 per lb. of U contained, f.o.b. works in 500-lb. lots.

Ferrovanadium — Per lb. of V contained, f.o.b. works, $3.25@$4.

Metal Products

Rolled Copper—Sheets, 22½c.; wire, 16c.

Lead Sheets—Rolled, 13c.; clipped, 13¼c.

Nickel Silver—29¾c. per lb. for 18 per cent nickel Grade A sheets.

Yellow (Muntz) Metal — Dimension sheets, 20½c. per lb.; rods, 17½c. per lb.

Zinc Sheets — 12c. per lb., f.o.b. works.

Refractories

Chrome Brick—$45@$48 per net ton, f.o.b. shipping point.

Firebrick—First quality, $43@$46 per M., Ohio, Kentucky, Central Pennsylvania; second quality, $35@$40.

Magnesite Brick—9-in. straights, $65 per net ton, f.o.b. works.

Silica Brick — $40 per M. Pennsylvania and Ohio, $48@$52 Alabama.

[1]**Zirkite**—Powdered, 80 per cent ZrO_2, 2½c. per lb. Brick, straights, 80c.@$1 each.

other parts of the world. The products of the blast furnaces were 51,631.50 tons of hard lead from ore, 4,865.60 tons of hard lead from refinery drosses, 4,683.50 tons of hard lead from copper ore and drosses, a total of 61,180.60 tons of hard lead; 5,206 tons of high-grade copper matte, and 2,000 tons of antimonial lead.

The following is the tonnage of slag produced, together with its approximate analysis from both lead and copper bearing material:

	Lead Slag	Copper Slag
Tons produced	106,240	35,605
Ag, oz.	0.900	0.884
Pb, per cent	3.377	3.222
ZnO, per cent	23.653	11.064
FeO, per cent	38.812	28.323
SiO_2, per cent	23.460	30.836
CaO, per cent	8.180	16.904

The refinery yielded 48,514.58 tons of refined lead and 5,068,584.90 oz. of refined silver.

Notwithstanding the effects of the fires progress has been made in most departments as will be seen from the following table:

	Twelve Months Ended		Increase		Decrease	
	June, 1924	June, 1925	Total	Per Cent	Total	Per Cent
Shifts worked	1,037,197	1,202,562	165,365	15.9	.....	....
Tons mined	277,231	289,006	11,775	4.2	.....	....
Tons hauled	786,097	847,012	60,915	7.7	.....	....
Traffic ton-miles	9,888,439	11,209,034	1,320,595	13.3	.....	....
Tons milled	273,220	250,722	.....	....	22,498	8.2
Tons lead products	135,711	110,991	.....	....	24,720	18.2
Tons zinc concentrates	12,364	17,332	4,968	40.2	.....	....
Tons charge smelted	233,602	254,369	20,767	8.9	.....	....
Tons refined lead	47,109	48,514	1,405	3.0	.....	....
Tons antimonial lead	1,073	2,000	927	86.4	.....	....
Ounces refined silver	5,134,209	5,068,584	.....	....	65,625	1.3
Tons copper matte	2,340	5,206	2,866	122.4	.....	....

Transvaal Gold Output Up

The output of gold from the mines of the Transvaal amounted to 787,633 oz. during the month of November, 1925, which compares with 812,832 oz. produced in October and 802,313 oz. in the month of November, 1924. The following table shows the monthly output for the past five years:

Transvaal Gold Production 1921-1925

	1921 Fine Oz.	1922 Fine Oz.	1923 Fine Oz.	1924 Fine Oz.	1925 Fine Oz.
January	651,593	639,728	764,469	796,768	823,692
February	558,137		704,970	760,617	753,925
March	671,123		761,586	795,671	825,479
April	681,382	511,338	743,651	768,923	787,519
May	687,776	629,786	786,564	809,003	813,249
June	678,490	675,697	755,309	773,053	780,251
July	689,555	730,635	754,306	829,437	818,202
August	711,526	752,490	769,371	809,571	808,218
September	691,026	747,089	739,504	799,422	797,247
October	707,825	778,159	793,842	827,583	812,832
November	704,236	764,476	780,639	802,313	787,633
Total eleven months	7,432,669	6,229,398	8,354,211	8,772,361	8,808,247
December	681,847	790,712	778,849	825,273	.....
Total	8,114,516	7,020,110	9,133,060	9,597,634	.....

In all probability the final figures will show the establishment of a new high record for the year. During 1925 the "premium" on gold disappeared entirely and the industry now is without any artificial support.

Imports and Exports of Ores and Metals in November, 1924 and 1925

Compiled by the U. S. Department of Commerce

In pounds unless otherwise specified

Imports

	November, 1924	November, 1925
Antimony		
Ore	201,920	142,708
Liquated, regulus, or metal	515,872	2,377,902
Copper		
Ores	17,028,329	8,397,268
Concentrates	2,654,488	4,641,077
Regulus, coarse metal and cement copper	21,159	155,921
Total	19,703,976	13,194,266
Imported from		
Spain	499,438	899,076
Canada	8,574,736	4,102,496
Mexico	1,746,950	2,502,122
Cuba	4,592,000	2,345,280
Chile	3,076,419	2,885,849
Colombia	26,390	25
Peru	481,886	156,987
Other countries	706,157	302,431
Unrefined, black, blister and converted copper in pigs, bars, and other forms	48,686,075	28,583,748
From		
Spain	4,358,753	.....
Canada	8,642,447	2,632,263
Mexico	8,473,970	4,652,048
Chile	18,138,113	1,121,143
Peru	3,461,134	8,674,490
Portuguese Africa	5,027,641	11,278,667
Other countries	584,017	225,135
Refined copper	16,496,505	13,052,403
Old and clippings for remanufacture	511,277	892,150
Composition metal, copper chief value	412	10,000
Copper manufactures	22,394	15,289
Brass, old and clippings for remanufacture	725,807	528,529
Lead		
Ore and matte (lead content)	5,243,286	6,884,529
Bullion or base bullion	13,198,374	14,238,341
Pigs, bars, other forms and old	642,298	169,649
Manufactures of, except type metal	39,487	66,241
Pyrites, long tons	15,855	26,458
Tin		
Tin ore, tons	35	14
In blocks, bars and pigs	9,386,703	10,244,729
From		
United Kingdom	1,400,031	3,766,586
British Straits Settlements	6,505,610	5,704,532
Dutch East Indies	.....	117,058
Hong Kong	168,000	185,336
Australia	103,040	145,200
Other countries	1,210,022	326,017
Zinc		
Ore, free	.....	.....
Dutiable	621,245	411,708
Blocks, pigs and other forms	.....	797
Zinc dust	8,396	6,473

Exports of Copper, Lead and Zinc

	November, 1924	November, 1925
Copper		
Ores, concentrates, matte and regulus	15,075	201,040
Copper and manufactures of	104,879,629	63,940,250
Refined in ingots, bars and other forms	97,562,168	55,651,193
Exported to		
Belgium	5,783,562	5,136,513
France	25,374,479	13,539,299
Germany	14,535,296	11,675,713
Italy	11,063,979	4,542,968
Netherlands	10,499,559	4,237,416
Spain	313,452	472,158
Sweden	1,458,185	2,466,442
United Kingdom	18,536,743	8,700,252
Canada	4,377,071	2,040,215
British India	168,517	.....
China	4,524,200	784,715
Japan	335,903	1,231,904
Other countries	591,222	823,598
Old and scrap copper	490,027	987,616
Pipes and tubes	133,301	199,569
Plates and sheets	241,206	251,362
Rods	4,603,002	3,555,804
Wire	629,561	449,028
Insulated copper wire and cable	1,083,919	2,683,632
Other manufactures of copper	136,445	162,046
Lead		
Pigs, bars, and other forms—		
From domestic ore	949,528	1,872,549
From foreign ore	10,452,861	10,120,365
Exported to		
France	1,960,343	1,568,475
Germany	561,214	2,371,385
Italy	.....	560,056
Netherlands	672,025	1,232,322
United Kingdom	6,710,213	4,873,132
Other Europe	952,242	728,146
Argentina	224,085	.....
Brazil	224,044	448,124
Japan	.....	232
Other countries	98,223	211,042
Other lead manufactures	1,573,198	2,184,437
Zinc		
Ores and concentrates	1,242	13,383
Dross	.....	1,423,317
Zinc (spelter) in slabs, blocks, or pigs	19,640,717	7,444,221
Exported to		
Belgium	896,278	336,029
France	2,465,708	840,095
Germany	145,692	895,922
Italy	1,333,131	1,176,123
United Kingdom	13,644,137	2,918,953
Other Europe	282,384	392,749
Canada	185,541	281,301
Japan	672,074	.....
Other countries	15,772	603,049
In sheets, strips and other forms	805,315	361,884
Zinc dust	281,970	402,091
Other zinc manufactures	107,402	154,722

Burma Corporation Does Well in Spite of Fire

The report of Burma Mines, Ltd., for the year ended June 30, 1925, by the general manager, P. E. Marmion, shows satisfactory progress in spite of the fire in the mines. The company mines silver, lead, zinc, and copper in the Northern Shan States of Upper Burma.

Profit and Loss and Appropriation Accounts for Year Ended June 30, 1925

Debit

	£	s.	d.
To operating expenditure			
Mine development, ore extraction and transport	329,304	6	11
Treatment	666,387	16	1
Freight, shipping and realization charges	293,768	16	4
Salaries and wages	31,297	1	8
Staff provident fund	17,383	0	2
Maintenance of roads, bridges, buildings and telephone service	22,631	8	2
Hospital, sanitation and police	15,899	0	0
General expenses	28,402	10	6
Rent and royalties	29,209	18	0
	1,434,283	17	10
Reports and experimental expenses	1,734	7	1
Head office expenses	21,500	15	7
London representative's office	26,756	18	3
Balance, being operating profit for the year carried down	1,413,340	13	3
	£2,897,616	12	0

	£	s.	d.
To interest on first mortgage 8 per cent convertible debenture stock	76,466	8	1
Depreciation on machinery, plant and railway	204,238	5	0
Loss on exchange	5,593	12	2
Income and super taxes	173,624	2	0
Balance, being net profit for the year	953,418	6	0
	£1,413,340	13	3

	£	s.	d.
To No. 4 dividend	380,860	0	0
To No. 5 dividend	380,860	0	0
To transfer to debenture redemption fund	957,445	16	7
	£1,719,165	16	7

Credit

	£	s.	d.
By metal sales and metals on hand	2,798,436	1	9
Interest	86,349	0	0
Sundry profits and receipts	9,127	5	0
Transfer fees	3,704	5	3
	£2,897,616	12	0.

	£	s.	d
By balance brought down	1,413,340	13	3
	£1,413,340	13	3

	£	s.	d.
By net profit brought down	953,418	6	0
Balance as at June 30, 1924, Less dividend No. 3	765,747	10	7
	£1,719,165	16	7

Ore Reserves—The ore reserve position at July 1, 1925, is shown in the table below. Again a large tonnage of copper ore has been exposed.

		Average Assay Value			
	Tons	Silver, Ounces	Lead, Per Cent	Zinc, Per Cent	Copper, Per Cent
Total Chinaman lode (proved and probable)	5,041,691	23.9	27.1	17.8	0.5
Total Shan lode	767,980	19.6	18.3	11.0	4.9
Total Palaung lode	14,910	26.6	11.7	11.0	8.8
Total proved and probable	5,824,581	23.4	25.9	16.9	1.1
Extracted	1,454,508	26.9	28.9	18.2	0.6
Reserve in mine	4,370,073	22.2	24.9	16.4	1.3
Ore stocks	983	20.1	22.8	12.5	1.2
Total ore reserves	4,371,056	22.2	24.9	16.4	1.3

The reserve in the mine compares with the position at July 1, 1924, as follows:

Date	Tons	Silver, Ounces	Lead, Per Cent	Zinc, Per Cent	Copper, Per Cent
July 1, 1924	4,499,866	22.5	25.2	16.6	1.3
July 1, 1925	4,370,073	22.2	24.9	16.4	1.3

Ore Extracted—During the period 289,006 tons of ore was extracted, having an average value as indicated below:

	Tons	Silver, Ounces	Lead, Per Cent	Zinc, Per Cent	Copper, Per Cent
Milling ore	245,616	20.3	22.6	13.8	0.7
High-grade ore	16,784	30.9	34.8	18.3	0.5
Total lead ore	262,400	21.0	23.4	14.1	0.7
Copper ore	26,606	19.6	13.0	8.2	6.7
Grand total	289,006	20.9	22.4	13.5	1.3

Labor—The average daily tonnage of ore extracted was 792, as against 759 for the previous twelve months, representing an increase of 33 tons, or 4.34 per cent.

The total number of shifts worked at the mine in all departments was 1,202,562, against 1,037,197 for the previous period, an increase of 165,365 shifts, or 13.7 per cent.

The nationalities now employed are represented as follows:

	Underground, Per Cent	Surface, Per Cent
Yunnanese (Chinese)	34.4	10.0
Chinese-Shans (Meingthas)	14.4	1.0
Gurkhas	47.0	30.0
Miscellaneous	4.2	59.0
	100.0	100.0

The "miscellaneous" include Kachins, Burmans, Sikhs, Chittagonians, Madrassis, and other Indians of all classes.

The tables show conclusively that for the conduct of its underground work the corporation relies entirely on labor recruited and attracted from territories outside the state in which it is situated. Having regard to the large number of men employed it can be stated from a practical standpoint that no indigenous labor is available.

Mine Fires—A fire occurred in the mine after 3 o'clock on the morning of Dec. 16, at the bottom of rise 1,604 ft. South No. 4 Level. Fortunately a large block of ground had been left intentionally around the internal shaft at about 1,500 ft. south which facilitated the work of isolating the fire and enabled normal underground conditions to be restored very quickly.

On Feb. 1 a second and much more disastrous fire occurred. The fire developed rapidly and it was decided to erect barricades on all levels at about co-ordinate 1,135 ft. south to seal off the whole area affected. The fire was securely under control by the end of February; meanwhile the work of extracting ore from the unaffected areas was carried on in the best manner possible.

Milling Operations—Alterations were made in the gravity section of the mill with the object of cutting out a larger proportion of middling to increase further the recovery of the zinc content of the ore. With the outbreak of the fire in the mine, the character and grade of ore delivered to the mill underwent a complete change, which necessitated the flow sheet being modified to meet the altered conditions. The tonnage of ore received at the mill bins was 253,008, having an average assay value of 20.03 oz. silver, 22.20 per cent lead, 13.68 per cent zinc, which compares with 264,949 tons, averaging 22.44 oz. silver, 24.84 per cent lead, and 15.88 per cent zinc for the previous twelve months.

The recoveries of silver and lead in the lead products railed to the smelter and of silver, lead, and zinc in the zinc concentrates, shipped to Europe were thus:

	Silver, Ounces	Lead, Per Cent	Zinc, Per Cent
Lead products	86.02	87.77	.....
Zinc concentrates	4.39	2.46	22.44

The average assay value and total metal content of the 17,331.74 tons of zinc concentrates recovered for shipment was as follows:

	Assay Value	Metal Content
Silver, oz	12.72	220,380
Lead, tons	7.93	1,374
Zinc, tons	44.37	7,691

The contract under which these concentrates were sold provided for the payment of the following metals:

Silver, oz	80,233
Lead, tons	92
Zinc, tons	6,305

The assay of the tailings produced during the period was:

Tons	Silver, Ounces	Lead, Per Cent	Zinc, Per Cent
71,543.85	3.18	3.33	4.39

Smelting Operations—The work of remodeling and extending this plant was continued and is approaching completion. Practically the whole of the old plant has been demolished, remodelled, and enlarged to the required capacity without interruption to the continuity of operations.

When the few remaining sections of the plant now in process of erection are completed the plant will be thoroughly modernized and comparable with similar plants in